KIRKIA

JOURNAL OF THE FEDERAL HERBARIUM, SALISBURY RHODESIA & NYASALAND

VOLUME 1
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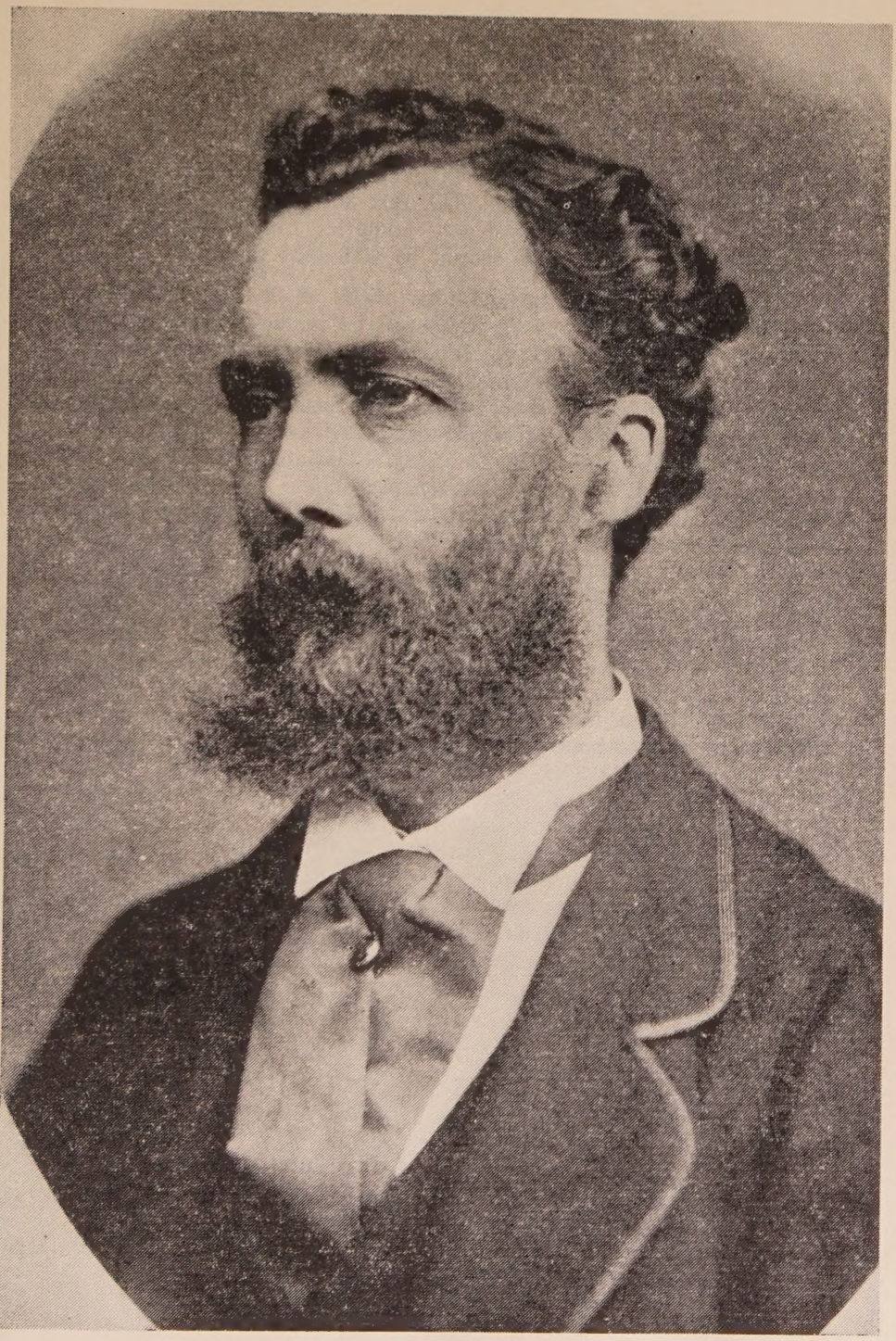

SIR JOHN KIRK
1832 — 1922

PROSPECTUS

KIRKIA is published by the Government Printer, Federal Department of Printing and Stationery, P.O. Box 8062, Causeway, Salisbury, Rhodesia and Nyasaland, and any enquiries for the purchase of complete volumes or reprints should be addressed to him.

Complete annual volumes will be priced at £1 10s. 0d. and the price for reprints of about 12 pages will be in the region of 2s. 6d. However, 50 reprints of taxonomic articles will be issued free to their authors and 25 to the authors of non-taxonomic articles. Articles submitted for publication should concern African botanical taxonomy, phytogeography, floristics or the history of African botanical exploration. They should preferably not exceed 12 printed pages and should be typed with double spacing. Latin names should be italicised, figures should be in indian ink on white bristol board or paper of similar quality and footnotes should be avoided.

The exchange of KIRKIA with other publications will be arranged and requests for such exchanges should be addressed to the Federal Herbarium, Branch of Botany and Plant Pathology, P.O. Box 8100, Causeway, Salisbury, Rhodesia and Nyasaland. It should be borne in mind, however, that an exchange is not likely to be offered for journals which do not contain a significant proportion of articles dealing with African botany.

THE FEDERAL HERBARIUM, SALISBURY, RHODESIA AND NYASALAND

The foundation of the Federal Herbarium, Salisbury (until recently the Southern Rhodesia Government Herbarium) dates from the appointment of H. G. Mundy in 1909 as Agriculturist and Botanist in the Agricultural Department of the Chartered Company's Administration (British South Africa Company). It is from this year that the first accession books of the herbarium date, although about 1,200 sheets collected in S. Rhodesia prior to 1909 are to be found in our collections. The earliest of these are probably those of F. Eyles whose first number, a specimen of *Evolvulus alsinoides* L. from Bulawayo, dates from January 2nd, 1902. Up till about 1923 the name of the herbarium as shown on our labels was the "Southern Rhodesia Department of Agriculture Colonial Herbarium" but from that date and possibly coinciding with the granting of self-government to Southern Rhodesia it became the S. Rhodesia Government Herbarium, Salisbury. With the Federation of the Rhodesias and Nyasaland in 1953 it has perforce become necessary to make a further modification to the "Federal Herbarium, Salisbury". This new title, however, has only come into use since 1959. The international abbreviation remains SRGH as before.

The herbarium has been since 1942 an integral part of the Branch of Botany and Plant Pathology and has now a collection of just over 100,000 specimens. Cryptogamic collections are very small except for those of *Pteridophyta*, the main emphasis being on *Phanerogams*. The flora of Southern Rhodesia is certainly better represented in this herbarium now than anywhere else and, by African standards, the proportion of Southern Rhodesia's flora preserved here is fairly high. Northern Rhodesia and Nyasaland are less well represented but in the last few years this disproportion has begun to be remedied and our Northern collections are now growing quite rapidly. The total increase in numbers is at present some 10,000 sheets annually. The flora of adjacent territories is also moderately well represented.

THE NEW JOURNAL

Until recently the smallness of our staff has meant that purely botanical publications emanating from the Herbarium have been rather few and somewhat sporadic. With the inception of the Flora Zambesiaca project, however, in 1956, and our active participation in this scheme as well as with the increase of our botanical staff to three systematic botanists, the need for a botanical journal has grown. Until now our only alternatives have been to publish work in rather unsuitable journals from a botanical point of view such as the Proceedings and Transactions of the Rhodesia Scientific Association or the Rhodesia Agricultural Journal, or, to publish in journals outside our area. In recent years we have received the most generous assistance in this respect from Professor A. Fernandes, editor of the Boletim da Sociedade Broteriana, but, however respected and widely distributed in international botanical circles this and other well known botanical journals are, they are very sparsely represented in our local libraries in the Federation. This is a considerable handicap to students of our flora resident in the Federation. There is also the further point that botanists, foresters and agriculturists with botanical leanings have grown rapidly in numbers in recent years, partly because of the recent foundation of the University College of Rhodesia and Nyasaland, but also in step with the rapid general growth of the country as a whole. Our journal will not only provide these botanists outside the Herbarium with an easily available source of taxonomic information relating to our area but will also offer them a suitable medium for their own botanical publications.

With regard to the aims of the journal our intention is to confine ourselves to articles concerning African botany and to give priority to articles dealing with taxonomy, floristic studies, phytogeography and the history of botany and botanical exploration which have some bearing on the flora of the Federation. Ecological articles may be published but usually only if they are of a general nature. As space permits we will welcome articles on these subjects relating to other African territories and particularly those territories which are our near neighbours.

With regard to our mode of publication we intend to follow the excellent system used in the Boletim da Sociedade Broteriana. Individual articles will be printed separately as soon as possible after approval by the editor and then a set of these will be sent to the authors for distribution. At the end of each year the accumulated articles will be bound into a single volume and offered for sale. It will also be possible to buy copies of individual articles. In this way we hope to avoid undue delay in the publication of new taxa.

The name chosen, KIRKIA, is to commemorate Sir John Kirk (1832-1922) who accompanied Livingstone as Botanist on his expedition to the Zambezi, Victoria Falls, Shire Valley, Lake Nyasa and the Rovuma

River between 1858 and 1863. He was the first botanist to collect in each of the three territories of the Federation. His extensive collections and field drawings are preserved in the Herbarium of the Royal Botanic Gardens, Kew.

The name KIRKIA has a second fortunate connexion with the Federation in that the handsome tree *Kirkia acuminata* Oliv. is widely distributed at the lower altitudes throughout our area (as well as in all our immediately neighbouring territories). The genus was published by Dr. Daniel Oliver in honour of Sir John Kirk who collected the type material of this species near the Zambezi River in Mozambique. It is somewhat less fortunate that the common Rhodesian name of this species is the Bastard Marula, presumably because its fruit is inedible as compared with the true Marula *(Sclerocarya caffra)* a tree with a similar appearance. We must hope that the fruits of our efforts are more palatable. Some amends are made by the fact that *Kirkia acuminata* is regarded as sacred by some Rhodesian Africans.

With the multiplicity of botanical journals in the world today it will not be surprising if the addition of a new one is received by botanists with some misgiving but we hope that the above explanation will help disarm any potential critics and that the contents of our future articles will continue to do so.

SIR JOHN KIRK

by

H. WILD,

Sir John Kirk, G.C.M.G., K.C.B., F.R.S., M.D., etc., was born in the village of Barry eight miles east of Dundee on December 19th, 1832, and was the second of four children of the Reverend John Kirk. His interest in botany began very early since this subject was one of the principal hobbies of his father, who was his tutor in his early years. He must, however, have been proficient in a wide variety of studies, as he certainly was in later years, since he matriculated at the age of 15 and entered Edinburgh University in 1847. For two years he studied in the faculty of arts and then spent five years as a student in the medical faculty, graduating as M.D., L.R.C.S. in 1854. During this period he continued his botanical studies and was a pupil of the famous Professor J. H. Balfour. He also became, whilst a student, a fellow of the Edinburgh Botanical Society.

On completing his degree he took a post as resident physician in the Royal Edinburgh Infirmary. In this, his first post, he had six other resident physicians as colleagues. He must have found this a most stimulating year since several of these colleagues became surgeons or physicians of note and one was Joseph Lister, the founder of modern antiseptic surgery. 1854 was, however, the first year of the Crimean War and, in common with many other young medical men, Kirk volunteered for service and sailed for the Crimea in 1855. He was stationed first at Scutari but then helped in the establishment of a large hospital in the Dardenelles. During the ensuing year the thread of his botanical interests can be seen continuing as he collected plants on Mt. Olympus and Mt. Ida. He also found time to do a little hunting and learnt Turkish. Returning to London in 1856 he soon went back to the Middle East and travelled through Syria, Palestine, Egypt and Italy. He returned in 1857 to London and published some of the results of these journeys in the Transactions of Edinburgh Botanical Society* and in the same year wrote his first letter, of what was to become a very long continued correspondence with Kew, to Sir William Hooker. At about this time he applied for the post of Professor of Natural History in the University of Kingston, Ontario, and was recommended for the post by Sir William Hooker and Professor Balfour. However, almost simultaneously, and before anything could become of this application, another plan was taking shape which was to decide the whole aspect of his future career. Dr. David Livingstone was at this time making

* Notice of the Plants of Mount Olympus. By Dr. John Kirk. With an account of the Ascent of the Mountain and observations on the Country near Broussa. By Dr. David Christison. *Trans. Bot. Soc. Edinburgh*, **5**, 162-165 (1858).

On the Occurrence of a New Muscari on Mt. Ida. By Dr. John Kirk. *Trans. Bot. Soc. Edinburgh*, **6**, 28-30 (1858).

preparations to return to Africa in order to continue his explorations of the Zambezi valley on a much larger scale than before. The expedition was being sponsored by the British Government and Livingstone was to be allowed to take a naturalist with him to help him investigate the agricultural and commercial possibilities of the Zambezi region. Sir Arthur Hill, the Director of Kew at the time of Kirk's death, tells the story that, on the day after his return from the Crimea, Kirk was walking in Queen Street, Edinburgh, and met Professor Balfour, who offered him the appointment of Naturalist to Livingstone's second expedition—"Kirk with the eagerness and impetuosity which was so characteristic of him replied " start tomorrow ! " Kirk, as a good Scot, was not impetuous in every respect and when Livingstone had signified to Kirk that he could consider himself officially appointed to the post he wrote to Livingstone to enquire what "necessary expenses" he should make provision for. Livingstone, as another good Scot, replied: "I am not quite clear as to what you mean with regard to necessary expenses. Suppose you shoot a buffalo, there will be no expense incurred in cooking and eating it. There are no inns or hotels in the country. The lodging will all be free . . . expeditions of this kind cannot be successful unless all the members are willing to rough it and it will be well if we all thoroughly understand this before we start. The salary is £350 per annum". (Livingstone to Kirk, 4th January, 1858.)

There will be no attempt here to describe in detail the Second Livingstone Expedition or even Kirk's part in it as a very full account of it can be found in "Kirk on the Zambesi" by R. Coupland and in the introduction of the Flora Zambesiaca Vol. I, part 1, where an itinerary of Kirk's journeys during the course of the expedition are given very fully by Miss Gwendolen Hayes with the object of making it easy to localise accurately the Kirk specimens preserved at Kew. It will be interesting, however, to pick out some of the highlights as far as they concern Kirk. The expedition left England on March 10th, 1858, and anchored off the West Luabo River (Luawe River) near the mouth of the Zambezi on May 14th. On July 4th, 1863, Kirk sailed from Quelimane and landed at Southampton on October 9th, 1863. That he was prepared to rough it is shown by the following quotations and incidents. In his diary for November, 1860, Kirk in describing his appearance says " the shoes are through and the heels are off, the trousers torn up to the knees, one arm of the shirt is nearly off". Beside his task of ministering to the sick members of the expedition and to the sick among the tribes through whose country they passed, Kirk did not escape severe attacks on his own health and well-being. As well as the frequent bouts of malaria, that were constantly with the expedition, particularly whilst on the lower Zambezi, Livingstone records on one occasion in June, 1860, "Kirk suddenly became blind and unable to stand . . . we laid our companion on a grassy bed with the sad forebodings which only those who have tended the sick in a wild country can realise". Within three days Kirk was back at work again but it may be that his privations at this time and the form they

took on this occasion were a foreboding of the blindness to which Kirk succumbed in the last few years of his life. In spite of these difficulties it is clear from Kirk's diaries, which consist of ten note books filled with careful pencil written notes and sketches, that only when enduring attacks of malaria did he express any grumbles concerning his personal lot. It is more remarkable still that he was clearly the only member of the expedition who did not quarrel openly with Livingstone. All who have read the various accounts of Livingstone's journeys will realize that this in itself shows that Kirk must have had the most outstanding qualities of forbearance and understanding. That Kirk succeeded in retaining Livingstone's regard where so many others failed was due in part to the fact that Kirk was the only member of the expedition who had the physical toughness and strength of will to match Livingstone's own. It was for this reason also that Livingstone chose Kirk to accompany him in March, 1859, when with the two sailors of the Royal Navy, Quartermaster Walker and Seaman Rowe, they left the rest of the expedition behind and set off northwards up the Shire valley. They were away four months and on April 16th they were the first Europeans to set eyes on Lake Shirwa, having already discovered the Shire Highlands and realised at once that with their healthy and invigorating climate, they would be ideal for European development. The origin of the towns of Blantyre, Limbe and Zomba stem from their discovery. Finally, the story of Kirk's loss of many of his specimens and all his equipment in the Kebrabasa rapids is worth retelling. On November 12th, 1860, whilst the expedition was shooting the rapids, Kirk's canoe was dashed against perpendicular rocks twenty feet high. The canoe filled with water at once and Kirk and his Africans were able to scramble out as the canoe was swept on past other less precipitous rocks. As he got out he was only able to snatch up a bag and his copy of Lindley's "Vegetable Kingdom". What affected him most deeply was his loss of eight volumes of notes and one hundred drawings of plants, as it later prevented him from publishing a complete account of his investigations westwards from Tete to the Victoria Falls and Sesheke. His specimens collected at the Victoria Falls itself were fortunately in another canoe and were saved for posterity. More human aspects of the expedition are also frequently revealed by his diaries. We read in the entry for 2nd July, 1858, that Thomas Baines, who also collected plants in what is now Southern Rhodesia on later journeys in 1862 and 1869-1870, was "at his pictures again", as he must so often have been when we think of the wealth of Baines' many oil-paintings of great historical value to our part of the world preserved in Rhodesian collections and elsewhere. He also considered Baines, whose job was storekeeper to the expedition, as its hardest worked member. He evidently remained on friendly terms with Baines in spite of Livingstone's quarrel with the latter in which he accused Baines of dishonesty in the handling of the stores and finally had him dismissed from the expedition. His word picture of Charles Livingstone is also amusing in relation to the wildness and unknown nature of South Central Africa at that time, "lounging indoors and never exposing himself without an

umbrella and felt hat with all the appurtenances of an English gentleman of a well regulated family. I fear most of us are not too particular about appearances when work is doing".

If we now pass to the results of his efforts during these five years they were remarkable when we remember that he was first in the field in so many ways and, as he himself says, "first explorers must be content with gleanings only; another time I hope to do more!" Some of his work took a very long time to bear fruit as the following misfortune shows. On March 7th, 1860, a member of the expedition left for Britain with four cases of Kirk's specimens consigned to Sir William Hooker at Kew. Twenty years later in 1883 his son, Sir Joseph Hooker, also Director of Kew, received a letter from Portsmouth Dockyard to say that four cases of specimens had been deposited there in 1870 and asked him to "kindly take steps to remove them from the yard". Their whereabouts during the years 1860-70 remains a mystery. Now, after a century has passed by, all his specimens are gradually receiving critical attention with the writing of the Flora Zambesiaca (Federation of Rhodesia and Nyasaland, Mozambique and Bechuanaland Protectorate). The more immediate achievement of his work was that he deposited at Kew a large collection from the Zambezi area which proved to be extremely rich in undescribed species and which was accompanied by a large and valuable collection of field drawings. He was the first to collect in Nyasaland, first also along the Rovuma River and at the Victoria Falls. On the lower Zambezi in Mozambique he was not necessarily the first to collect but his material added tremendously to the botanical records of the region. Kirk was also one of the earliest amateur photographers and he developed an almost professional competency at the art. He was thus the first to photograph the vegetation of the Zambezi region. An excellent selection of his vegetation photographs is published by Coupland in "Kirk on the Zambesi" and is of great phytogeographical and ecological interest. He also added the heart drug strophanthine to the pharmacopœia and kept at his final home at Sevenoaks, Kent, arrows poisoned with an extract of *Strophanthus kombe* shot at him and Dr. Livingstone by Nyasaland natives. Possibly because of the loss of the note books referred to earlier his published scientific results relating to the expedition are not very extensive but they have tremendous interest as being the first of their kind and they have certainly been neglected far too long. This is partly because the journals in which they appear are not available, in this part of the world at least, and it is desirable to make some mention of them here. First is a "Report on the natural products and capabilities of the Shire and Lower Zambesi valleys" (Proc. Roy. Geogr. Soc. **6:** 25-32 (1862)), dated from Sena the 28th December, 1860. This includes excellent descriptions of the vegetation, the economic life of the native tribes and reports on their crops. He speaks of native cotton-growing in particular, describes the Batoka highlands of Northern Rhodesia as suitable for cattle and as having a pleasant climate suitable for European settlement. He also recommends the Shire Highlands for European

development and suggests that coffee should be grown in the Manganja Hills of Nyasaland. He describes the production of rubber from the liane *Landolphia kirkii* Dyer and describes the wood of the mopane *(Colophospermum mopane* (Kirk ex Benth.) Kirk ex J. Léonard), the original description of which is based on his material and field description. Next we have "On a few fossil bones from the Alluvial Strata of the Zambesi Delta" (Journ. Roy. Geogr. Soc. **34:** 199-201 (1864), "Notes on the gradient of the Zambesi on the level of Lake Nyasa, on the Murchison Rapids and on Lake Shirwa (op. cit. **35:** 167 (1865)) and "Notes on two expeditions up the River Rovuma, East Africa" (tom. cit.: 154). Once again in this last article we have an excellent description of the vegetation, as well as a description of the geography, tsetse flies, native population, etc.*

After Kirk's return to Britain in 1863 he severed his direct connexion with our area but he remained dedicated for the rest of his life to the welfare and progress of Africa. In 1866 he took up an appointment in Zanzibar, first as medical officer, but soon after as Vice-Consul and finally as Consul-General. He was also appointed Political Agent in Zanzibar for the Government of India. His wife, whom he married shortly before going to Zanzibar, accompanied him and during the twenty years of his stay there they brought up together a family of six children. The work for which he is famous during this period was the suppression of the Zanzibar slave trade and in 1873, by opposing his strength of will to a very reluctant Sultan, he succeeded in negotiating a treaty which ended Zanzibar participation in the slave trade. Despite the difficulties of this situation in regard to his personal relations with the Sultan he retained the latter's personal friendship throughout. He was obviously a remarkable man in his handling of others, especially in situations of strain and difficulty.

On April 18th, 1874, Kirk was a pall-bearer with Stanley and Jacob Wainwright at Livingstone's funeral in Westminster Abbey; Wainwright was one of the Africans who carried Livingstone's body to the coast after his death. In 1886 Kirk returned from Zanzibar and went to live at Sevenoaks in Kent but he still remained active in African affairs. In 1889-90 he attended the Brussels African Conference as British Plenipotentiary with Lord Vivian. Because of his long and valuable experience of the slave trade he played a considerable part in framing the General Act of the Conference by which the European Powers agreed to take joint prohibitive action in regard to the import of arms to Africa. For his efforts at this conference he received the K.C.B. He also became at about this time Foreign Secretary of the Royal Geographical Society and a Fellow of the Royal Society.

* See also—

(1) Account of the Zambesi District, in South Africa, with a Notice of its Vegetable and other Products. By Dr. John Kirk, late of the Livingstone Expedition. *Trans. Bot. Soc. Edinburgh,* **8,** 197-202 (1866).

(2) Note from Dr. John Kirk to Prof. Balfour read 11 Feb. 1864: accompanied two pods of a tree closely allied to *Bauhinia* or *Copaifera. Trans. Bot. Soc. Edinburgh,* **8,** 110-111 (1866).

To return to botanical matters, Kirk maintained an experimental garden at his own expense in Zanzibar and continued his frequent correspondence with Kew until his death, in spite of his progressive blindness in his last years. He died in his ninetieth year on 15th January, 1922, and was buried in Sevenoaks. His funeral was attended by, among others, Sir Francis Younghusband on behalf of the Royal Geographical Society, Sir Frederick Lugard and Dr. A. W. Hill (later Sir Arthur Hill), the Director of Kew.

To conclude, of the many tributes to his character paid to him on many occasions, perhaps the most fitting is that said by Lugard—"For Kirk I had a deep affection which I know was reciprocated. He was to me the ideal of a wise and sympathetic administrator on whom I endeavoured to model my own actions and to whose inexhaustible fund of knowledge I constantly appealed". Kirk was another of those giants produced by the nineteenth century who had such an influence on the development of Africa, in particular during the period when the interior of this continent was being explored and opened up to European influence. Through his gifts of character and intelligence he was able in turn to be physician, botanist and naturalist, and administrator. He devoted these gifts and his position to the welfare of humanity and it is his just reward that the name of this journal will remind us of his worth.

SELECTED BIBLIOGRAPHY

Anon (1895), Sir John Kirk. *African Review* **5:** 701.

Anon (1922), Sir John Kirk. *African World* **77:** 501.

Coupland, R. (1928), *Kirk on the Zambesi.* Clarendon Press, Oxford.

Exell, A. W. and Wild, H. (1960), *Flora Zambesiaca* **1,** 1. Crown Agents for Overseas Governments, London.

Hill, A. W. (1922), Sir John Kirk. *Kew Bull.* **1922:** 49.

Kamin, J. (1954), *They Served the People.* The Bodley Head, London.

Livingstone, D. & C. (1865). *Narrative of an expedition to the Zambesi and its tributaries.* John Murray, London.

See also Kirk's papers mentioned in the text.

ACKNOWLEDGMENTS

I would like to express my grateful thanks to the Director of the National Archives, Salisbury, for making the works I have consulted available to me and to the Director of Kew for permission to reproduce the photograph of Sir John Kirk.

VITACEAE FROM THE FLORA ZAMBESIACA AREA: 1

by

H. WILD & R. B. DRUMMOND

Cissus granitica Wild and Drummond, sp. nov.

C. tenuissimae Gilg & R.E. Fries affinis sed stipulis pedicellisque glandulosis atque foliolis majoribus differt.

Herba perennis, scandens, ramulis ad 1.5 m. longis glabris longitudinaliter striatis; cirrhi bifurcati glabri. *Folia* digitata, 3—9-foliolata, petiolo 0.5—2.5 cm. longo glabro; foliola ad 11 x 0.7 cm., subsessilia, membranacea, glabra, lineari-lanceolata, apice longe acuminata, basi longe anguste cuneata, margine dentibus glandulosis sparse serrata. *Stipulae* 0.3—1 cm. longae, lanceolatae vel ovato-lanceolatae, acuminatae, margine glandulosae. *Cymae* ad 15 cm. diam., compositae, laxiflorae, trichotomae, pedunculo ad 6 cm. longo longitudinaliter striato glabro; bracteae ad 2 mm. longae, lanceolatae vel subulatae, margine glandulosae. *Flores* pedicello ad 5 mm. longo, sparse breviter stipitato-glanduloso. *Alabastrum* ad (2)3.5 x 1.5 mm., cylindricum, ad apicem inflatum, ad medium constrictum. *Calyx* ad 1 mm. altus, roseus, patelliformis, margine subinteger. *Petala* pallide flava, c. 2.5 x 1.3 mm., oblonga, cucullata, glabra. *Stamina* 2.5 mm. longa; antherae c. 0.75mm. longae, oblongo-globosae. *Ovarium* c. 1 mm. longum, glabrum; stylus c. 1 mm. longus; stigma indistinctum. *Baccae* rubrae, c. 1.2 x 0.8 cm., ellipsoidae, glabrae, semine unico; semen nigrum, c. 7.5 x 5 mm., ellipsoideum, valde horizontaliter rugosum.

Type: *Wild* 4883 (BRLU; K; LISJ; PRE; SRGH, holotype).

SOUTHERN RHODESIA. Northern Div.: Umvukwes, fr. 24.iv.1948, *Rodin* 4416 (PRE); Ruorka Ranch, among rocks on Great Dyke, 1600 m., fl. 16. xii. 1952, *Wild* 3919 (SRGH):— fruits reddish; Darwin Distr., Mvurkwe, on chrome hills, 1600 m., fl. 21. xii. 1952, *Wild* 3978 (K; SRGH). Central Div.: Salisbury Distr., Domboshawa, 1600 m., st. xi. 1923, *Eyles* 6914 (K; SRGH); ibid., fl. 29. xi. 1946, *Greatrex* in FHS 15555:—flowers yellow; ibid., on granite rocks, fr. 16.xi.1947, *Wild* 1665 (SRGH):—fruits bright red; ibid., fl and fr. 23.i.1952, *Wild* 3756 (SRGH):—calyx pinkish, petals yellow; ibid., fr. 12.iii.1958, *Seagrief* in CAH 2186 (SRGH). Eastern Div.: Inyanga, Inyangombe Falls, among granite rocks, 1600 m., fl. 3. xii. 1959, *Wild* 4883 (BRLU; K; LISJ; PRE; SRGH).

This species belongs to Section *Cyphostemma* Planch, and is well known on the granite rocks of Domboshawa.

Cissus zambesica Wild & Drummond, sp. nov.

C. paucidentatae Klotzsch et *C. bororensi* Klotzsch affinis sed petiolis pedicellisque glandulosis differt.

Herba perennis, scandens; caules ramique longitudinaliter striati, pilis glandulosis stipitatis sparsissimis nodis densioribus praediti; cirrhi glabri, bifurcati. *Folia* digitata 3-4 (5)-foliolata; petiolus 1.5—3 cm. longus, pilis simplicibus supra et sparsis glandulosis infra ad summum densioribus praeditus; foliola membranacea, subsessilia aut petiolulis c. 1 mm. (ad 15 mm. in mediana foliolo) longis, pilis simplicibus supra glandulosis stipitatisque infra praeditis, elliptica vel late elliptica, margine dentibus apiculato-glandulosis serrato-crenata; superior pagina glabra sed nervo medio atque majoribus lateralibus simplicibus pilis praedita; inferior pagina glabra sed nervo medio glandulosis stipitatis pilis sparse praedita; foliolum medianum ad 7.5 x 3.8 (4.8) cm., apice mucronatum, basi anguste cuneatum; foliola lateralia ad 6 x 3.8 cm., apice mucronata, basi obtusa asymmetrica. *Stipulae* 5—7 x 2 mm., persistentes, falcatae, acuminatae, margine glandulosae. *Cymae* compositae, usque ad 11 cm. diam., pedunculo ad 3.5 (4.5) cm. longo longitudinaliter striato glandulosis stipitatis pilis apice praedito; bracteae ad 1.5mm. longae, lanceolatae, glabrae. *Flores* pedicello ad 6 mm. longo glandulosis stipitatis pilis 0.5 mm. longis praecipue ad medium praedito. *Alabastrum* c. 2.5 x 1.25 mm., cylindricum, versus apicem intense rubrum, ad medium constrictum, ad apicem inflatum. *Calyx* ad 0.5 mm. altus, glandulosus, subinteger. *Petala* 2.5 mm. longa, glabra. *Stamina* 1.5 mm. longa; antherae 0.75 mm. longae. *Ovarium* 1 mm. longum, glabrum; stylus 1.5 mm. longus; stigma indistinctum. *Baccae* 8 x 5 mm. (siccae), rubrae, glabrae, semine unico; semen 5 x 4 mm., ellipsoideo-globosum, rugosum et minute tuberculatum.

Type: *Drummond* 5371 (K; PRE; SRGH, holotype).

NORTHERN RHODESIA. Western Prov.: Ndola, from anthill, fl. 8. i. 1955, *Fanshawe* 1781 (K; NDO; SRGH):—vine with dark crimson stems, flower cream and crimson; Kitwe, from anthill, fr. 12. iii. 1957, *Fanshawe* 3037 (NDO):—fruits green, flushed crimson. Southern Prov.: Ngwesi R., fr. 15.i.1956, *Gilges* 553 (PRE; SRGH); Choma Dist., Mapanza, shady riverside rocks, fl. 14.xii.1958, *E. A. Robinson* 2943 (K; SRGH):—1.6 m. creeper, perianth dark red, centre of flower creamy white.

SOUTHERN RHODESIA. Northern Div.: Binga Distr., bank of Dett R., sandstone outcrop, 830 m., fl. 8. xii. 1956, *Lovemore* 519 (SRGH):—creeper, flowers red; Kariba Distr., Mensa Pan, c. 17 km. ESE. Chirundu bridge, edge of *Combretum* thicket, 460 m., fl. 30.i.1958, *Drummond* 5371 (K; PRE; SRGH):—climber with tendrils, tips of buds

dark red; Chirundu road, Zambesi Valley, on *Grewia* sp. in thicket, fl. 16.i.1953, *Lovemore* 352 (SRGH):—climber, flowers yellow, buds red; Mazoe Distr., in vlei at foot of granite kopje, 1320 m., fl. & fr.i.1907, *Eyles* 504 (BM; SRGH):—small vine with tendrils, leaves glabrous.

This species also belongs to Sect. *Cyphostemma* Planch.

TRICERATELLA, A NEW GENUS OF COMMELINACEAE FROM SOUTHERN RHODESIA

by

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Among the very numerous duplicates generously presented by the Federal Herbarium at Salisbury, Southern Rhodesia, to the Royal Botanic Gardens, Kew, one of the most outstanding is the subject of this paper, a little Commelinaceous herb collected by Mr. R. B. Drummond in Beitbridge District. The material is most copious (deliberately so, I suspect) and, again unusually and significantly, no determination was attached to it at Salisbury. Mr. Drummond must be congratulated on a remarkable discovery.

At a first glance the plants look anything but Commelinaceous, indeed in general appearance much more reminiscent of the Toad Rush, *Juncus bufonius* L. When the plants are examined in greater detail, no doubt is left about the family in which they should be placed, but there is no obvious resemblance to any other *Commelinaceae,* dissection showing numerous and significant features separating them from each of the hitherto known genera. These relationships will be discussed later on. I believe the differences to be certainly of generic importance, and therefore make for these plants a new genus, *Triceratella.* The name is given in allusion to the three persistent valves of the capsule, which, after the latter has dehisced, curve outwards or even downwards and look like three small horns.

Triceratella Brenan, gen. nov. tribus *Commelinearum* sensu Rohweder, Die Farinosae in der Vegetation von El Salvador, 172 (1956); in familia aliquid separatum sed ut videtur, haudquaquam autem sine dubio, *Stanfieldiellae* Brenan proximum, foliis linearibus, sepalis majoribus, petalis luteis, filamentis staminum pubescentibus, valvis capsulae post semina liberata basi persistentibus supra patulis vel etiam more cornuum parvorum recurvis, seminibus in quoque loculo numerosis biseriatis radialiter costatis, hilo punctiformi in fovea pro semine maxima depresso, embryostega prominenti dorsali facillime distinguenda.

Herba annua, parva, plus minusve glanduloso-pubescens. Folia linearia. Inflorescentiae e cincinnis axillaribus simplicibus plus minusve elongatis vaginas haud perforantibus compositae. Flores subsessiles, singulatim ex axillis bractearum floralium orti. Sepala 3, majuscula, antico quam alia paulum longiore. Petala 3, libera, aequalia vel subaequalia, oblanceolato-oblonga. Stamina 6, aequalia vel subaequalia, filamentis pubescentibus. Stylus breviusculus sed ab ovario distinctus. Ovula numerosa, secundum duas placentas contiguas in quoque loculo ordinata. Capsula lineari-oblonga, trivalvis, valvis post semina liberata basi persistentibus supra patulis vel etiam recurvis. Semina in quoque loculo

numerosa, biseriata, plus minusve hemiellipsoidea, radialiter costata, fovea pro semine maxima excavata cujus in fundo hilum minimum punctiforme; embryostega prominens, dorsalis (ovula hinc ut videtur orthotropa).

Typus generis: *T. drummondii* Brenan.

Triceratella drummondii Brenan, sp. nov., in genere adhuc unica.

Herba annua, 2.5-13 cm. alta, ubique floribus praeter sepala exceptis breviter et sparsiuscule glanduloso-pubescens, pilis ipsis articulatis; radices omnes e basi, fibrosae. *Caulis primarius* erectus, brevissimus, circiter 0.5-4 cm. longus, simplex, sed in plantis majoribus caules secundarii pauci e nodis pedunculorum cincinnorum nonnunquam exorientes; internodia caulium primariorum et secundariorum brevissima. *Folia* linearia, circiter 3-12(-18) cm. longa, 1-2.5 mm. lata, apice attenuata-acuta, basi in vaginam brevem membranaceam usque ad 6-7 mm. longam brevissime (c. 2 mm.) clausam vel saepe sed forsan rumpendo apertam. *Cincinni floriferi* ex axillis foliorum caulis primarii orti, pedunculo brevi usque ad circiter 2 cm. longo incluso usque ad circiter 3 cm. longi, pedunculo folio unico iis caulis primarii simili saepe praedito, cujus ex axillo caulis secundarius nonnunquam oriens; cincinni fructiferi nonnunquam elongati, cincinnos alios juniores superantes, pedunculo usque ad 5 cm. longo, parte fructifero ad 10 cm. longo. *Bracteolae* anguste lanceolatae vel lineari-lanceolatae, 5-12 mm. longae, inferne 1-1.5 mm. latae, hyalino-marginatae, superne longe sensimque subulato-attenuatae. *Sepala* anguste lanceolatae, 2-3 mm. latae, antico 16-19 mm. longo, aliis 13-14 mm. longis. *Petala* lutea, inferne angustata sed haud unguiculata. *Stamina* filamentis 3.5-5 mm. longis inferne applanatis, antheris 0.7-1 mm. longis 0.4-0.75 mm. latis. *Ovarium* oblongum, circiter 4 mm. longum, 0.6 mm. latum, glabrum, stylo glabro 2 mm. longo. *Capsula* stramineo- vel griseo-brunnea, 7-10 mm. longa, 2 mm. diametro. *Semina* grisea usque brunnea, 0.7-0.75 mm. diametro.

SOUTHERN RHODESIA. Beitbridge District: near Chiturupadzi Store, 40 km. NNW of the Bubye-Limpopo Junction, in moist sand on Forest Sandstone in association with *Bacopa floribunda, Fuirena leptostachya, Xyris rubella, Torenia spicata*, etc., 12 May 1958, *R. B. Drummond* 5780 (K. holotypus; PRE; SRGH)—apparently an annual; petals yellow.

During the last thirty years much print has been devoted by various authors to the classification of genera within the family *Commelinaceae*. Their conclusions are often by no means in agreement. For many years C. B. Clarke's excellent account of the whole family in DC., Monogr. Phan. **3**, 113-324 (1881) was with justification relied upon, and indeed today this work is still indispensable in any detailed study of the family. A new system was proposed by Brückner, in Engl., Bot. Jahrb. **61**, Beibl. 137, 1-70 (1926), and further elaborated by him in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, **15a**, 159-181 (1930). Important modifications

to this scheme were made by Pichon in Not. Syst. **12**, 217-242 (1946). In 1942 Woodson's "Commentary on the North American genera of *Commelinaceae*" appeared in Ann. Miss. Bot. Gard. **29**, 141-154 (1942) in which for the first time the inflorescence was used as a primary character in subdividing the family. Although Pichon's work was published four years after Woodson's, Pichon seems to have been unaware of its existence. In 1956, Rohweder, Die Farinosae in der Vegetation von El Salvador, 98-178, considered the classification of the *Commelinaceae* in great detail, in particular the limits of the tribe *Tradescantieae*, and although his work was designed primarily to elucidate the family as it occurs in El Salvador, his discussion and conclusions are based on such a breadth of evidence that they have an importance much more than local.

How does *Triceratella* fit into these various schemes? In C. B. Clarke's arrangement of 1881, it clearly is in the Tribe *Tradescantieae* on account of its loculicidally three-valved capsule and 6 fertile stamens. Within the tribe the only genera with more than two seeds per loculus are *Buforrestia* C.B.Cl. in the Old World, and *Pyrrheima* Hassk., *Dichorisandra* Mikan and *Tinantia* Scheidw. in the New.

In Brückner's arrangements of 1926 and 1930 emphasis is laid on the actinomorphy or zygomorphy of the flowers as a primary basis for dividing the family. The actinomorphic flowers and six equal fertile stamens of *Triceratella* would place it in Brückner's Subfamily *Tradescantieae*, Tribe *Hexandrae*. In his key to the tribe it comes down without difficulty to *Pyrrheima* on account of its equal stamens, biseriate seeds, dehiscent 3-valved fruits and free petals. *Buforrestia* and *Dichorisandra* are also in the *Hexandrae*, but in another group with uniseriate seeds, while *Tinantia* is excluded on account of the zygomorphy of the androecium. If *Triceratella* is keyed in Brückner's group of the *Hexandrae* with uniseriate seeds, it comes down easily to *Buforrestia*.

In Pichon's arrangement (1946), *Triceratella* also comes clearly into the Tribe *Tradescantieae* in the neighbourhood of *Tradescantia* L. and *Pyrrheima*, *Buforrestia* being excluded on the unsatisfactory character of the bracts of the cymules (i.e., cincinni) being "différentes des feuilles". *Dichorisandra*, near which it came in Clarke's arrangement, is separated as a separate tribe, as is *Tinantia*.

Woodson's treatment of the North American genera (1942) emphasized the importance of paired cincinni in the *Tradescantieae* and, according to his arrangement, *Triceratella* would be a member of the *Commelineae*. Rohweder (1956) likewise considered the inflorescence-structure to be of primary importance for separating the Tribe *Tradescantieae* from that of *Commelineae*, and here again *Triceratella* comes clearly into the latter in the neighbourhood of *Thyrsanthemum* Pichon.

One can see that divergent conclusions about the position of *Triceratella* are reached by using different systems. C. B. Clarke's system, laying emphasis on the androecium and the dehiscence or not of the capsule, has been found by use to be artificial and sometimes very difficult to apply. Brückner's system, although an improvement, can be similarly criticized, while that of Pichon represents an elaboration of Brückner's principles. The clearer definition of the *Tradescantieae* by Woodson and Rohweder by the structure of the inflorescence seems an improvement; Rohweder, in particular, elaborately discussed the earlier systems and also had the great advantage of having seen many of the genera in their native home. On Rohweder's system, then, which I consider the most acceptable, *Triceratella* is a member of the Tribe *Commelineae*.

The generic affinity of *Triceratella* remains to be discussed. The following genera have been mentioned as possibilities:—

(1) *Buforrestia* C.B.Cl. It has been shown elsewhere (Kew Bull. **14**, 280-296 (1960)) that *Buforrestia*, as usually interpreted, is a mixture of two distinct genera, *Buforrestia* itself and *Stanfieldiella* Brenan.

From *Buforrestia* itself *Triceratella* differs in the linear leaves, the inflorescences not perforating the leaf-sheaths, the flowers borne singly at the nodes of the inflorescence, the equal yellow petals, the equal stamens with straight pubescent filaments, the distinct filiform style and the more numerous radially ribbed biseriate seeds. Although *Buforrestia* shares with *Triceratella* the unusual feature for this family of having numerous seeds in the capsule, there does not seem otherwise to be a very close relationship.

Triceratella differs from *Stanfieldiella* in the linear leaves, larger sepals, yellow petals, pubescent stamen-filaments, the outwardly curving capsule-valves remaining attached at base, and the radially ribbed biseriate seeds. The structure of the seed, with a protuberant boss-like embryostega at one end, and with a deep pit at the other end—so deep as to hollow out the seed—in whose centre is the minute punctiform hilum, is very different from that of *Stanfieldiella*, and indeed also from that of other Commelinaceous seeds known to me. I believe, however, that an affinity, although not a close one, may be found here. The pit in the seed may be partially filled by a thin spongy tissue, particularly noticeable when the seed is wet, and perhaps an outgrowth from the hilum.

(2) *Pyrrheima* Hassk. *Triceratella* differs from *Pyrrheima* in the narrow yellow, not round blue petals, the pubescent not glabrous stamen-filaments, the glabrous not densely hirsute ovary, the more numerous ovules, and the much smaller more numerous and radially striate seeds. *Pyrrheima* furthermore differs utterly from *Triceratella* in its general appearance—stemless or nearly so and "covered throughout (except at the corolla) by a rough tawny-brown fur" (Bot. Reg. t.482: 1820-21).

Although *Triceratella* arrives near *Pyrrheima* in various keys, I am totally unable to see any close resemblance or evidence of near affinity between the two genera.

(3) *Dichorisandra* Mikan. *Triceratella* differs by its inflorescences being composed of axillary cincinni but not aggregated into terminal thyrses, the yellow not blue petals, the pubescent stamen-filaments, the anthers opening by slits not pores, the more numerous ovules and the more numerous small exarillate radially striate seeds with a round hilum and dorsal embryostega. I do not consider that a close affinity is to be found here.

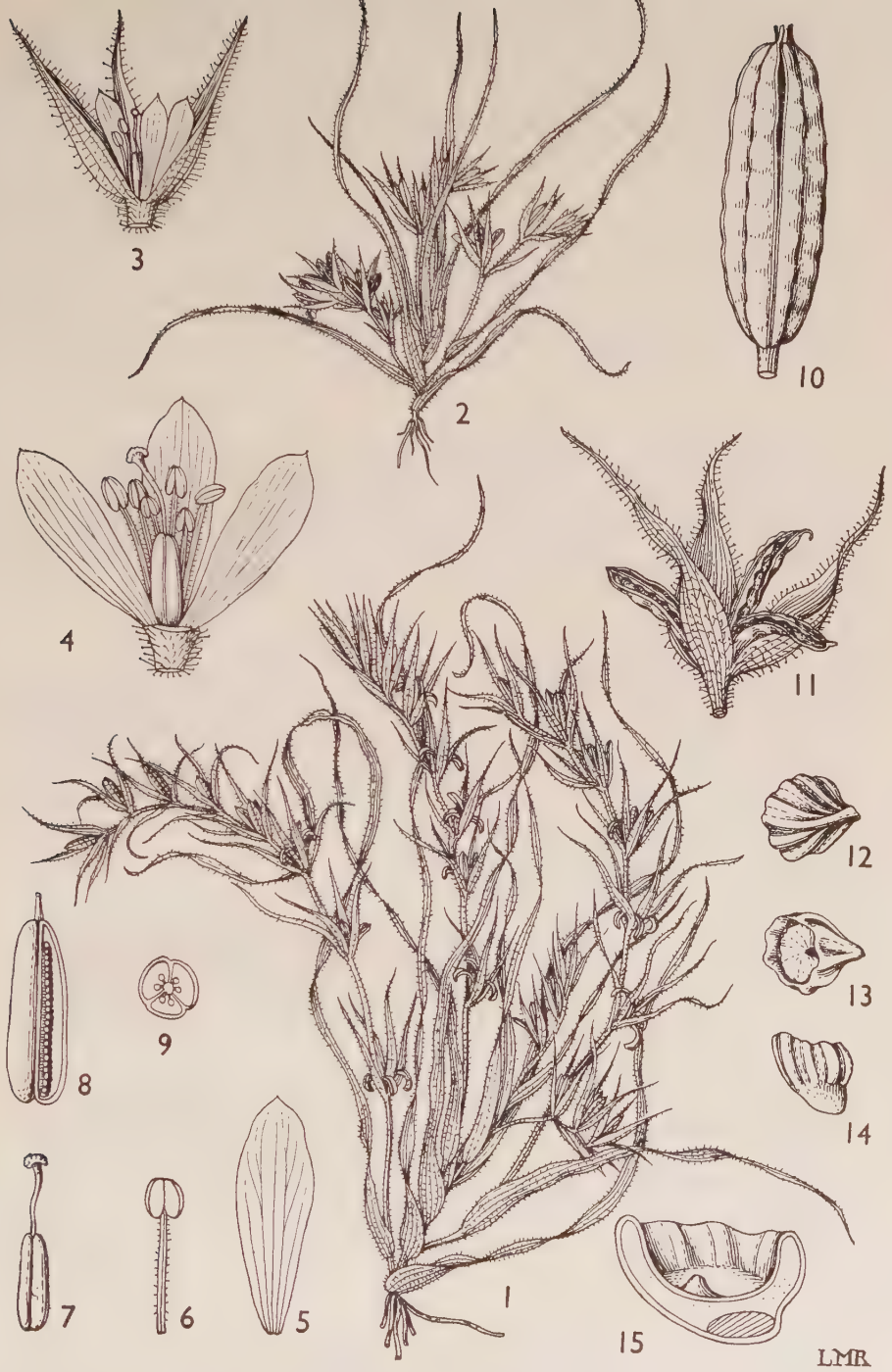
(4) *Tinantia* Scheidw. *Triceratella* differs in not having terminal solitary or aggregated cincinni, in having yellow not blue or purple petals, an actinomorphic not zygomorphic androecium, more numerous ovules and more numerous seeds with a round not linear hilum and a dorsal not lateral embryostega. Here also I can see no reason for suggesting close affinity.

(5) *Tradescantia* L. According to Rohweder's views, discussed above, with which I agree, *Tradescantia* comes in the Tribe *Tradescantieae,* on account of its inflorescence-structure, while *Triceratella* is in the *Commelineae,* and there is thus no close relationship between the genera. This distinctness is reinforced by other characters of *Triceratella,* such as the yellow petals, the more numerous ovules and seeds, and the round not linear hilum.

(6) *Thyrsanthemum* Pichon. The thyrse-like inflorescence of this genus, the pubescent ovary, the two ovules per loculus, and the non-striate seeds with a linear hilum and lateral embryostega, not to mention the very different general appearance of the plant, do not support any idea of close affinity with *Triceratella.*

There is one further genus, so far not mentioned, which has certain features in common with *Triceratella.* It is *Anthericopsis* Engl., which has large sepals, numerous ovules and seeds and a very elongate capsule whose valves, of rather similar appearance and texture to those of *Triceratella,* have a tendency to curve outwards from the apex as the capsule dehisces. The differences from *Triceratella* are, however, numerous and important: the three antesepalous stamens of *Anthericopsis* are much reduced staminodes, the filaments are glabrous and the fertile anthers very elongate; the seeds are certainly uniseriate in each loculus (in spite of assertions to the contrary by Engler and Brückner) and of peculiar form—oblong, about 3-4 times as long as broad, ± angled or subcylindrical in section, smooth, with a linear hilum and lateral embryostega; in addition, the terminal umbelliform pedunculate inflorescences, each consisting of apparently two sessile or subsessile cincinni whose central axes do not elongate, are altogether at variance with those of *Triceratella.* I do not consider *Anthericopsis* and *Triceratella* have any close affinity.

To sum up, then, *Triceratella* seems to show fewer significant divergences from *Stanfieldiella* than from other genera, and should be placed systematically after that. It should be made clear, however, that the affinity with *Stanfieldiella* is not an obviously close one, the biseriate seeds of *Triceratella* in particular being an important difference.



Tab. I.—**Triceratella drummondii.**—1, large plant in fruiting condition, x 2/3; 2, smaller, flowering plant, x 2/3; 3, flower, x 2; 4, flower with sepals removed, x 4; 5, petal, x 4; 6, stamen, x 4; 7, ovary with style and stamen attached, x 4; 8, ovary, with 1 loculus shown in longitudinal section, x 8; 9, ovary, cross-section, x 8; 10, capsule before dehiscence, x 6; 11, capsule after dehiscence, showing persistent calyx, x 2; 12, seed shown from embryostegal end, x 16; 13, seed from hilar end, x 16; 14, seed lateral view, x 16; 15, seed cut longitudinally, x 32. All from *Drummond* 5780.

EVERGREEN FOREST RELICS IN NORTHERN RHODESIA

by

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INTRODUCTION

Scattered across the high rainfall belt of Northern Rhodesia are small islands of closed evergreen forest under a rainfall regime varying from forty to sixty inches per annum, all of which falls between November and April. All the known occurrences represent what is probably best termed dry evergreen forest. These forests occur on level ground or gentle slopes.

Soils are variable, mostly sandy at least in their upper layers, but they have one common factor—ample available moisture throughout the dry season. The Kawambwa area is an exception. Soils vary from the very deep, almost sterile sands of the Kalahari series in Mwinilunga and Solwezi district, which have been leached of all their bases, to the deep, granular sands of the Luano forest reserve derived from the weathering of the granite domes, to the very deep reddish sandy loams derived from granite of the Kawambwa area, to the deep sandy loams of the Abercorn area derived from sandstone, to the very deep red sandy clays derived from schists and quartzites of the Katanga series in the Ndola area. Clay soils hold more water for a given depth of soil than sands, but the great depth of all these sands and sandy loams ensures an ample supply of soil moisture throughout the dry season.

Dry evergreen forest is a three-storeyed forest with a closed canopy of evergreen or occasionally semi-deciduous species, forty to eighty feet high, a discontinuous evergreen understorey between thirty and fifty feet and a well-marked almost continuous shrub-scrambler layer of evergreen species between five and twenty feet. Ground vegetation is normally sparse, occasionally absent, frequently consisting only of moss or rain forest grasses. Emergents above the canopy level are occasional to frequent.

Climbers are common but do not always reach the canopy. Epiphytes are comparatively scarce. Regeneration of the dominant species is generally excellent, quite sufficient to perpetuate the forest type in the absence of fire.

Dry evergreen forest is known to occur in the following districts—Mwinilunga, Solwezi, Copperbelt, Kawambwa, Abercorn.

Three types of dry evergreen forest are represented in these districts:—

(1) *Parinari-Syzygium* forest.

(2) *Cryptosepalum pseudotaxus* forest.

(3) *Marquesia acuminata* forest.

PARINARI-SYZYGIUM FOREST.

Typically a consociation of *Parinari excelsa* and *Syzygium guineense* subsp. *afromontanum* with a higher proportion of *Parinari* than *Syzygium*. *Entandrophragma delevoyi* is an occasional emergent, to ninety or a hundred feet high. The bulk of the understorey is composed of *Aidia micrantha* with *Pouteria magalismontana, Cassipourea congoensis* and *Rothmannia whitfieldii* frequent. The dense shrub-scrambler layer is composed largely of *Tricalysia revoluta* (a non-revolute form), *Artabotrys monteiroae* and *Opilia celtidifolia*. *Strychnos lucens* is the commonest climber with *Jasminum streptopus* growing abundantly as a suffrutex. The grasses are of typical rain forest genera—*Bromuniola, Megastachya* and *Oplismenus*.

The type occurs around Ndola, where there are three known sites: (a) North Rise; (b) Chichele Forest Reserve; (c) Ndola sample plots.

A variation of the type occurs in a few relic patches in the Chinakila district of Abercorn, obviously the remains of a once much larger patch. The three dominants of a very broken canopy are a new species of *Pouteria*, a new species of *Parinari* or allied genus and *Syzygium guineense* subsp. *afromontanum*. *Leptaulus, Maytenus acuminatus* and *Sorindeia juglandifolia* are the commonest understorey trees with *Craterispermum* forming the bulk of the understorey layer. *Opilia celtidifolia* and *Tiliacora funifera* are common climbers. The ground floor is virtually bare except for seedlings of woody species.

Between Ndola and Kitwe in Misaka Forest Reserve there is a two-acre pre-climax patch of dry evergreen forest dominated by pure *Erythrophleum guineense*. This patch is still immature as *Syzygium* and *Parinari* form an understorey to the *Erythrophleum* canopy, and the shrub layer is extremely restricted as to species with only *Pouteria, Rothmannia* and *Craterispermum laurinum*. The two former are understorey species in the main type above. It seems as if not so long ago, the area was swept by a fierce ground fire which killed off most of the understorey and shrub layer, killed back the rest but left a lot of the *Syzygium* and *Parinari*. Opening of the canopy gave access to *Erythrophleum* which prospered exceedingly and now forms a canopy over the former *Syzygium-Parinari* canopy. In time there will be a consociation of *Erythrophleum, Parinari* and *Syzygium*.

Secondary or very immature dry evergreen forest can be found in a number of places on the Copperbelt. In fact any site with a dense, evergreen thicket is a potential dry evergreen forest. Some sites are more advanced than others. The best example is in Luano Forest Reserve around the granite domes which are such a feature of that area. The thicket is very dense but contains small groves of trees which would, if fire protected, in time produce a patch of dry evergreen forest with a closed canopy. These groves contain the following species typical of the *Parinari-Syzygium* type—*Erythrophleum guineense, Pleurostylia, Aidia, Apodytes, Cassipourea congoensis, Pouteria magalismontana* and *Rothmannia whitfieldii.*

CRYPTOSEPALUM PSEUDOTAXUS FOREST.

This type of dry evergreen forest is known as "mavunda" in Mwinilunga and Solwezi districts. It is restricted to the Kalahari sands, usually on the highest parts of the sandcap.

In the north-west, under a slightly higher rainfall, emergents are frequent—*Marquesia acuminata, Marquesia macroura, Brachystegia spiciformis, Parinari excelsa* and *Syzygium guineense subsp. afromontanum.* Under a slightly lower rainfall further south, either there are no emergents or they are represented by the odd Brachystegia species—*Brachystegia spiciformis* and *Brachystegia longifolia,* and *Guibourtia coleosperma. Syzygium guineense* is locally common.

Cryptosepalum pseudotaxus is always dominant and occasionally pure in the canopy layer. The crowns are often tied together with lianes such as *Combretum microphyllum, Uvaria angolensis, Artabotrys monteiroae, Ancylobothrys* and *Landolphia* spp.

Diospryros undabunda is conspicuous in the understorey amidst a dense liane-scrambler evergreen thicket of those species mentioned above and others. Where there is no dense understorey there is a low scrub layer largely composed of *Copaifera baumii, Bauhinia macrantha* and various *Rubiaceous* shrubs.

The forest floor is often covered by moss or sparse rain forest grasses.

MARQUESIA ACUMINATA FOREST.

This type of dry evergreen forest occurs on very deep, reddish sandy loams derived from granite. *Marquesia acuminata* is strongly dominant, almost pure. Only *Daniellia* occurs in the canopy layer otherwise. Two species of *Memecylon, Sorindeia juglandifolia, Olea welwitschii* and *Podocarpus* share the understorey with *Marquesia* saplings. The fairly continuous shrub layer consists largely of *Marquesia* with various *Rubiaceae* especially *Craterispermum laurinum.* The forest floor has a complete but open cover of *Bromuniola gossweileri.* Climbers and scramblers are common, especially *Hippocratea africana* and *Strychnos robynsii.* There is some affinity with the Chinakila forest.

Regeneration of the dominant *Marquesia* is ample in all size classes. If the present canopy was to die off altogether as a result of old age, the understorey *Marquesia* would merely grow up to take its place. This appears to have happened in at least one block at Kawambwa.

The islands of low level, dry evergreen forest are always found within a framework of dense, evergreen thicket, but the surrounding woodland in which the thicket lies can be of two types: (a) disturbed; (b) undisturbed by fire.

On certain Copperbelt sites—Ndola sample plots, Misaka and Luano —dry evergreen forest with its surround of evergreen thicket occurs within the framework of top quality miombo woodland dominated by *Brachystegia spiciformis, Brachystegia longifolia* and *Isoberlinia angolensis* and, in the case of Luano, *Brachystegia microphylla* in addition. This represents the relatively undisturbed site.

In other cases on the Copperbelt—North Rise, Chichele—and in Kawambwa, Mwinilunga, Solwezi and Chinakila where the original vegetation of the framework might well have been top quality miombo woodland, fire has obviously been extremely destructive, has killed out the original vegetation and replaced it with fire-hardy species like *Combretum, Erythrophleum, Pterocarpus* and *Terminalia,* the so-called "chipya" species. Fire can produce this effect, and in a very short time, as the burning plots at Ndola prove. After twenty years of annual late burns at Ndola, the vegetation is beginning to resemble chipya vegetation in that the fire sensitive miombo species have disappeared leaving the fire-hardy chipya species.

Obviously the fire is not so destructive to thicket as to the tree species in the dry evergreen forest so that where the trees are killed by fire, the thicket survives in the surrounding chipya woodland. This suggests that dry evergreen forest under a more pluvial regime was more widely distributed than it is today and very likely covered those areas which are now occupied by chipya woodland and evergreen thicket.

Dry evergreen forest occurs in the adjoining territories of Nyasaland, Tanganyika (possibly), Belgian Congo and Angola. "Forêt dense sèche" similar to *Parinari-Syzygium* forest occurs in Katanga Province of Belgian Congo, where the local name for these islands of forest is "muhulu". According to Devred, the dominant species are *Entandrophragma delevoyi, Parinari excelsa, Marquesia macroura, Majidea multijuga* and *Ficus mammosa.* Regeneration is excellent. Oddly enough *Syzygium guineense* is not mentioned as a dominant but is probably present.

Cryptosepalum pseudotaxus forest occurs in the Lunda province of Angola, adjacent to Mwinilunga district. It is locally called "Mufuka" forest. Dominants are *muFuka (Marquesia macroura)* and *Daniellia alsteeniana* associated with *Cryptosepalum pseudotaxus, Berlinia giorgii,*

Guibourtia coleosperma and *Parinari curatellifolia subsp. mobola.* Apart from the presence of *Daniellia* and *Berlinia* this is very similar to *Cryptosepalum* forest in Mwinilunga and Solwezi districts.

It is evident that all these relic forests are related in some way. There appears to be some sort of floristic affinity as one travels from east to west or vice versa.

With the exception of the Kawambwa forests, the characteristic species *Parinari excelsa* and *Syzygium guineense* are either present or dominant on all the other sites. The Kawambwa forests are also anomalous in other respects.

The Kawambwa forests show signs of wilting in the ground cover and shrub layers as early as July. How closed evergreen forest persists at this site if there is a certain lack of water over the critical dry season months of August-October I cannot say, but it may account for the fact that the dominant *Marquesia acuminata* acts as a semi-deciduous tree on this site instead of being evergreen as elsewhere.

The Copperbelt, Solwezi and Mwinilunga forests are obviously closely related. *Cryptosepalum pseudotaxus* in the Mwinilunga and Solwezi "mavunda" can be regarded as an understorey species which has assumed the rôle of dominant in the absence of the original (?) dominants *Parinari* and *Syzygium. Marquesia acuminata* links the "mavunda" and the Kawambwa forests and *Sorindeia* and *Craterispermum* the Chinakila forests to the Kawambwa forests.

The rain forest relics here described are extremely interesting to the botanist and ecologist but of little importance to the forester. They should be of interest, however, to the phytogeographer in his efforts to determine what the forest cover was like in previous epochs. To those of us who were trained in the humid tropics, they provide the interest in what is otherwise a rather dull vegetation cover.

NEW CONVOLVULACEAE FROM THE FLORA ZAMBESIACA AREA

by

BERNARD VERDCOURT

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During the preparation of the account of the family Convolvulaceae for the Flora of Tropical East Africa (which, although complete, will probably not appear for some time) a number of new taxa have been noted from Central Africa. Several of the more distinct ones are described here. Dr. Meeuse, who has completed an account of the Convolvulaceae of South Africa and also a paper on S. Rhodesian Convolvulaceae, has examined much of the material described in this paper but the views expressed are entirely my own.

Seddera welwitschii Hallier f. subsp. **tenuisepala** Verdcourt, subsp. nov., a subsp. *welwitschii*, foliis minoribus, venis et venulis subtus conspicuis, sepalis apice elongato-acuminatis differt.

Herba perennis, caulibus prostratis(?), pilis albis subpatentibus obtectis. *Folia* elliptico-oblonga, basi cuneata, 1.3-2.0 cm. longa et 0.45-1.1 cm. lata, apice acuta vel obtusa et mucronata, pilis albis appressis utrinque sparse obtecta; costa, venae venulaeque supra impressae, subtus pallidae, reticulatae, prominentes; petioli 0.5-1.5 mm. longi. *Inflorescentiae* 3-6 florae, pedunculis usque 2 cm. longis. *Sepala* elliptica, apice foliacea, acutissima, ± recurvata. *Corolla* alba, 5.5 mm. longa. Tab. II.

BECHUANALAND PROT. Sigara Pan, 48 km. W. of mouth of Nata River, on sandy ground under *Adansonia*, 896 m., 25 April, 1957. *Drummond & Seagrief* 5223 (K, holotype of subspecies, SRGH, isotype (not seen)).

This plant is strikingly different from typical *Seddera welwitschii* Hallier f. and may prove to be worthy of specific rank when more material of the entire group has been collected. As in all species of this genus with pedunculate inflorescences, or single flowers on long pedicels, the apical inflorescences or young inflorescences are often sessile. The lower pedunculate inflorescences occasionally have one or two sessile flowers at the base of the inflorescences so it is possible that there are genuinely two distinct types of inflorescences. Dr. Meeuse has sunk *S. welwitschii* Hallier f. into *S. suffruticosa* (Schinz) Hallier f., but I am convinced that this is not correct. *S. suffruticosa* has sessile inflorescences and a different facies. Admittedly pedunculate inflorescences occur in forms that one can only refer to this species (e.g., *Breyer* s.n. from SW. Africa), but single instances in the breakdown of characters, if followed in every case, would lead to the sinking together of scores of

undoubtedly distinct species. *S. suffruticosa* is a very variable plant and extends as far north as Karamoja in Uganda (recent record by Mrs. Symes). I have seen very little material from East Africa and although not identical with South African sheets it has the characteristic facies of true *S. suffruticosa*.

Bonamia velutina Verdcourt, sp. nov., a congeneribus, habitu minore, caulibus erectis et sepalis majoribus distinguenda.

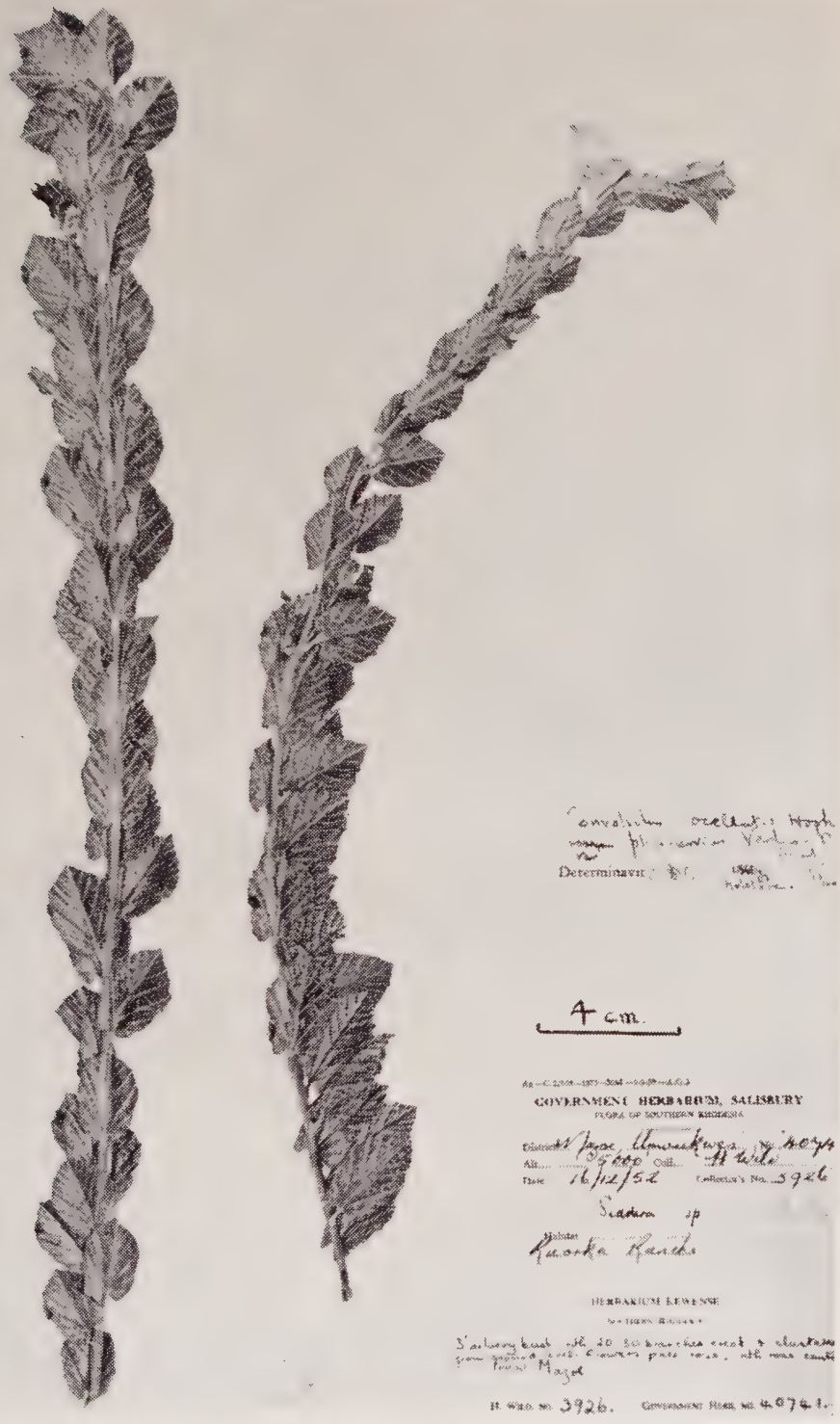
Herba vel suffrutex perennis, erecta, tomentosa, usque 0.9 m. alta; caules subflexuosi, ramosi, teretes, ramis pilis sericeis appressis dense obtectis. *Internodia* 0.5-2.5 cm. longa. *Folia* elliptica vel elliptico-oblonga, basi rotundata vel subtruncata, apice acuta, mucronata, 1.2-3.6 cm. longa et 0.4-1.2 cm. lata, pilis griseo-argenteis vel aureis, dense velutineque obtecta; petioli 1.5-4 mm. longi; nervi laterales utrinsecus 5-6, costa et nervi supra impressi, subtus valde prominentes. *Inflorescentiae* 1-2(-3)-florae, pedunculis 0-3.5(-6) mm. longis, pedicellis 0-1.5 mm. longis, bracteis foliaceis vel minutis. *Sepala* subaequalia, ovato-lanceolata, obovata vel spathulata, basi subcoriacea, apice foliacea, extra pilis aureis appressis dense velutine obtecta, intus basi glabra, apice pilosa; tria exteriora spathulata, basi oblonga, 3 mm. longa et 1.5 mm. lata, apice dilatata, 3.5-4 mm. longa et 2.5-3.5 mm. lata; duo interiora ovato-lanceolata, 6.5 mm. longa et 2.5 mm. lata, apice acuta, haud dilatata. *Corolla* alba, infundibuliformis, 0.9-1.2 cm. longa, apice 1.3 cm, lata, leviter 5-lobata, extra fasciis mesopetalis dense pilosis. *Stamina* 5, filamentis 6-7 mm. longis, basi dilatatis, parte dilatata oblonga 1.8 mm. longa, apice leviter bidentata; antherae 1 mm. longae. *Styli* glabri 6-6.8 mm. longi, basi breviter, 1-1.5 mm., connati; stigmata lobulato-peltata, 0.5 mm. lata. *Ovarium* ovoideum, 1 mm. longum, densissime aureo-pilosa. *Capsula* ellipsoidea, subacuta, 6 mm. longa, basi et apice appresse pilosa. *Semina* ellipsoidea, sordide brunneo-purpurea, glabra, minutissime punctulata, 2.8 mm. longa et 1.8 mm. lata. Tab. III.

SOUTHERN RHODESIA. Nuanetsi district, in *Combretum*-Mopane woodland on sandstone, 495 m., Nov. 1955, *Davies* 1629 (EA,K,SRGH):—herb 0.6-0.9 m. tall; ibid., 0.4 km. within Southern Rhodesian border opposite Malvernia, in *Guibourtia*-Mopane woodland on Umkondo sands, 450 m., 1 Nov. 1955, *Wild* 4688 (K, holotype, SRGH, isotype (not seen)):—perennial 0.3 m. tall, flowers white.

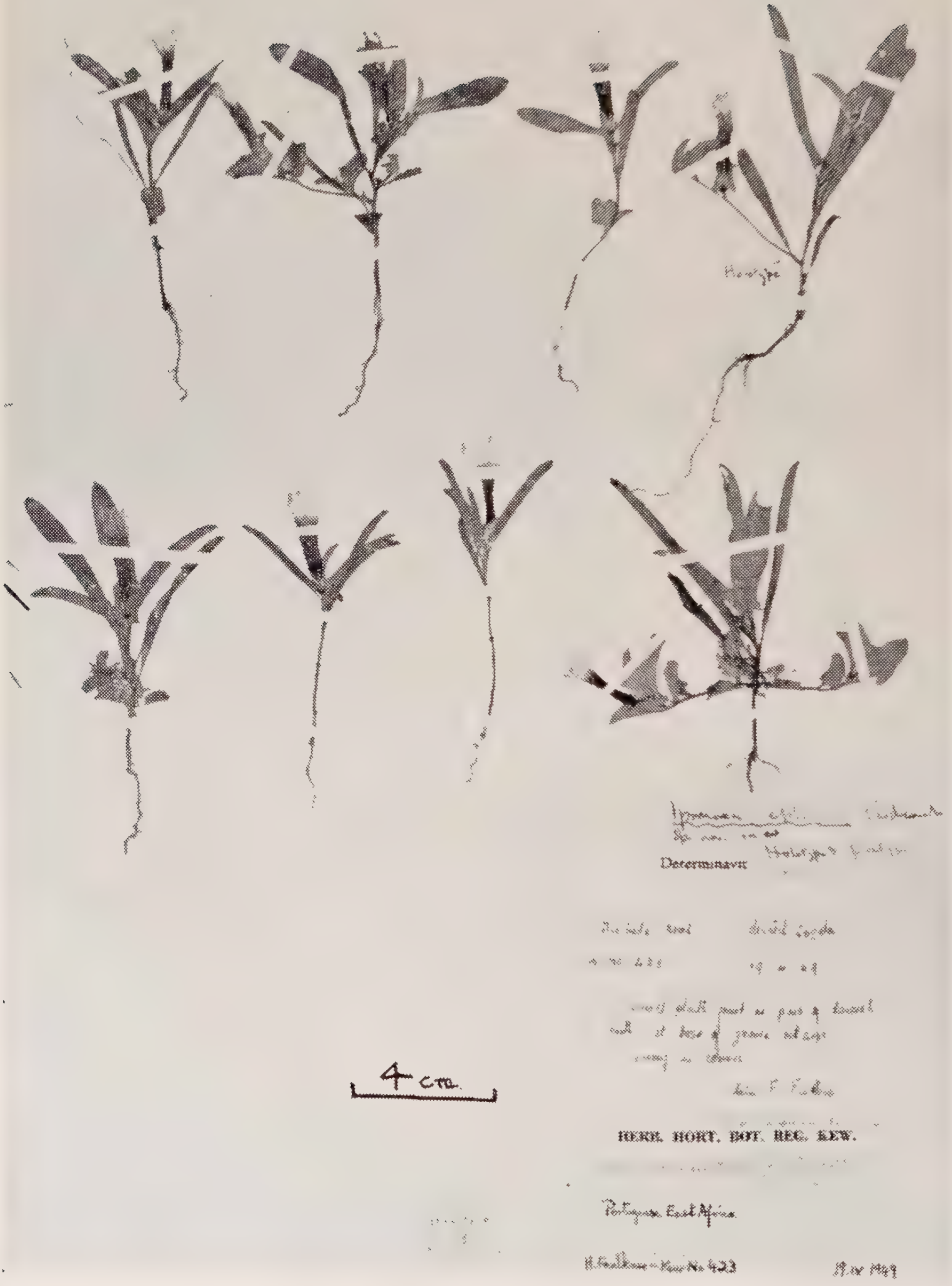
Neither collector gives any data concerning the actual habit of the plant but it would appear to be erect. This is a very distinct species quite unlike any other *Convolvulaceae* known to me. The genera *Seddera* and *Bonamia* are sometimes united by authors, but the heterogeneity of the mixture is sufficient reason for not doing so. This present species is one of those which could be used as evidence for the amalgamation, since it is a small erect subshrub only slightly taller than the species referred to *Seddera*; the facies is, however, definitely that of a *Bonamia*. The final division of the Convolvulaceae into genera will be a very recondite matter

Tab. II.—**Seddera welwitschii** subsp. **tenuisepala** Verdcourt (holotype).

Tab. III.—**Bonamia velutina** Verdcourt (holotype).



Tab. IV.—**Convolvulus ocellatus** var. **plicinervius** Verdcourt (holotype).



Tab. V.—**Ipomoea ephemera** Verdcourt (holotype).

but the result will either be large unwieldy genera or small genera which are not closely definable. At present I prefer to tamper as little as possible with the traditional genera, though I must admit that if *Seddera* and *Bonamia* are kept apart then *Ipomoea* might be dismembered into about ten genera. Studies on a world basis are the only ones upon which final decisions should be made.

Convolvulus ocellatus Hook f. var. **plicinervius** Verdcourt, var. nov. a var. *ocellato* et var. *ornato* (Engl.) Meeuse, foliis ovato-oblongis vel foliis superioribus elliptico-ovatis vel rhomboideis, basi non emarginatis, vel subsagittatis distincta.

Frutex vel suffrutex erectus, 0.45-0.9 m. altus, caulibus numerosis caespitosis erectis foliosis, ubique argenteo-tomentosus vel dense velutineque hirsutus. *Internodia* 0.5-3 cm. longa. *Folia* ovato-oblonga vel rhomboidea, ± bullata, apice acuta, basi emarginata vel subsagittata, margine leviter vel grosse dentata, circa 3.5 cm. longa et 2.5 cm. lata, dense velutineque aureo- vel argenteo-tomentosa, petiolis 3-4 mm. longis, nervis lateralibus utrinsecus 6-10, supra impressis, subtus valde prominentibus; vel folia inferiora lineari-oblonga, apice acuta, basi cuneata, 2-3 cm. longa et 0.5 cm. lata, petiolo 2-3 mm. longo et folia superiora elliptico-ovata vel rhomboidea, apice acuta vel acuminata, basi subtruncata, 3 cm. longa et circa 1.5 cm. lata. *Flores* axillares, solitarii, pedunculis ± 2 cm. longis, bracteis linearibus, 6-7 mm. longis in medio dispositis. *Sepala* ovato-lanceolata vel anguste ovata, 0.8-1 cm. longa. *Corolla* alba vel pallide rosea, medio roseo-oculata, 1.6-1.8 cm. longa, fasciis mesopetalis extra pilosis vel argenteo-pubescentibus. Tab. IV.

SOUTHERN RHODESIA. Mazoe District. Umvukwes, on chrome hills, 1500 m., 16 Dec. 1952, *Wild* 3926 (K, holotype of subspecies, EA, isotype, SRGH isotype (not seen)):—silvery bush to 0.9 m. with 20-30 branches, erect and clustered, from ground level, flowers pale rose, with rose centre. Lomagundi District, west side of Umvukwes Range where crossed by new main Salisbury-Lusaka road, some 24 km. south of Kildonan, near summit of grassy hill on serpentine, 1440 m., 25 Feb. 1959, *Drummond, Jackson & Phipps* 5851 (EA, SRGH (not seen)):—erect perennial, corolla white with pale pink centre.

The two plants cited above and figured, were annotated as being new species of *Convolvulus* but they are, I think, members of a variable complex centred round *C. ocellatus* and since typical plants of the latter are to be found in Southern Rhodesia, varietal rank is the only safe one to bestow; the two cited plants were considered at first to be separate nameable entities, but Dr. Wild has informed me that intermediate plants have been observed, so they should not be separated. The three variants of *C. ocellatus* may be separated as follows, although some forms of var. *ornatus* are difficult to key.

Leaves palmately 5-fid ... ... var. *ornatus*
Leaves undivided or at most coarsely serrate:
Leaves emarginate, or subsagittate with basal auricles:
Leaves linear to linear-oblong ... ... var. *ornatus*
Leaves rhomboidal or ovate-oblong ... var. *plicinervius*
Leaves without auricles, subtruncate or cuneate:
Leaves linear to linear-oblong ... ... var. *ocellatus*
Leaves linear-oblong only at base of stem, ovate-elliptic or rhomboidal above ... var. *plicinervius*

Amongst some material put on one side at Kew for me to determine was a sheet of a *Merremia* which I could not match with any African material from memory. Unfortunately, I had no time to deal with the plant and borrowed the specimen. I was at first deluded into considering it to be a new species since it apparently came from a wild habitat. Examination of further material preserved at Pretoria and kindly loaned to me made me immediately suspicious and I finally identified the plant as follows. Since it appears to be spreading I append a description so that it can readily be recognised.

Merremia quinquefolia (L.) Hallier f. in Engl., Bot. Jahrb. **16**, 552 (1893); van Ooststroom in Flora Malesiana, Ser. 1, **4**, 446, fig. 28 (1953).

Perennial herb with graceful scandent stems, glabrous or sparsely to densely covered with patent setae 2-3 mm. long. *Internodes* 4-8 cm. long. *Leaves* glabrous, palmate, 3-5-foliolate; petiole 0.5-3 cm. long, glabrous or setose, leaflets sessile, lanceolate, narrowly cuneate at the base, acuminate at the apex, margins serrate; central leaflet 5.3 cm. long and 0.9 cm. wide, lateral leaflets about 2 cm. long and 0.4-0.5 cm. wide. *Inflorescences* axillary, 1-2(-5)-flowered, peduncles up to 5.5 cm. long, densely papillate towards the apex; true pedicels 5-6 mm. long; bracts minute. *Sepals* glabrous, oblong-ovate, subtruncate or emarginate at the apex, mucronulate; two outer ones smaller, 6-7 mm. long and 2.5-3.5 mm. wide, inner three 8-9.5 mm. long and 3.5-4.5 mm. wide. *Corolla* glabrous, yellow, narrowly infundibuliform, base tubular, 2 cm. long, limb slightly lobed, lobes 4 mm. long and 8 mm. wide. *Stamens* 5, unequal, filaments 7.5-9.5 mm. long, adnate to the base of the corolla, where they are widened and glandular-papillate; anthers 3.3 mm. long, often twisted at the apex; pollen grains smooth. *Style* filiform, glabrous, 13.5 mm. long; stigma biglobular. *Ovary* globose, glabrous, 1.5 mm. in diam. *Capsule* subglobose, about 1 cm. in diameter. *Seeds* black, oblong-ovoid, trigonous, 4.5 x 3 mm. covered with scattered brownish pubescence.

MOZAMBIQUE. Manica and Sofala: Chimoio District, Bandula mountain, in scrub lands, 600 m., 5 April, 1958, *Chase* 6873 (K, EA, SRGH (not seen)). Niassa: May, 1944, *Gomes e Sousa* 4 (PRE):—a climbing plant, cultivated in the gardens of Nampula, common. 9 Nov., 1942, *Hornby* 4602 (PRE):—stringy climber in coast thorn

bush (no exact locality given on the label). Zambezia: Mocuba, 75 m., 5 June, 1949, *Gerstner* 7108 (PRE):—creeper in bush, flowers dirty yellow-cream. Lourenço Marques: Ponta Vermelha, 25 Sept., 1945. *Pedro* 144 (PRE):—prostrate herb.

Ipomoea ephemera Verdcourt, sp. nov. a congeneribus habitu multo minore, foliis superioribus subhastatis stellato-tomentosis valde distincta; affinis *I. leucanthemo* (Klotzsch) Hallier f., corolla 2.5-3 cm. longa differt.

Herba parva, erecta, annua, circa 7.5 cm. alta. *Caulis* non vel parce ramosus, stellato-tomentosus, etiam pilis setaceis patentibus sparse ornatus. *Internodia* 0.3-2.5 cm. longa. *Cotyledones* subpersistentes, demum deciduae, quadratae, basi truncatae, apice emarginatae, circa 8 mm. longae et 7 mm. latae. *Folia* inferiora linearia vel oblongo-linearia, apice rotundata vel subacuta, basi cuneata, 3-5 cm. longa et 4-6 mm. lata, petiolis circa 4 mm. longis; folia superiora oblonga vel lineari-oblonga, apice rotundata vel subacuta, basi breviter hastata, 1-4.5 cm. longa et 0.7-1 cm. lata, petiolis circa 5 mm. longis, omnia utrinque stellato-pubescentia. *Flores* axillares, solitarii, pedicellis 2-5 mm. longis, bracteis linearibus, circa 4 mm. longis. *Sepala* ovato-lanceolata, 8.5-10 mm. longa et 2.5-3 mm. lata, basi membranacea, nervosa, apice foliacea, anguste acuminata, stellato-pubescentia, margine ciliis patentibus ornata. *Corolla* anguste infundibuliformis, glabra, 2.5-3 cm. longa, tubo angusto 2 cm. longo rubro-purpureo, limbo pallido (albo vel flavo?). *Stamina* 5, filamentis inaequalibus, 9-12 mm. longis, antheris 1.8 mm. longis; granula pollinis spinulosa. *Stylus* filiformis, 13.5 mm. longus, stigmate bigloboso. *Capsula* immatura glabra, globosa, 4 mm. diam. Tab. V.

MOZAMBIQUE. Zambezia: Lugela District, Muobede road, in pans of dampish earth at base of granite outcrops, gregarious, 19 April, 1949, *Faulkner* K 423 (K, holotype and paratypes, eight plants on one sheet, EA, paratype).

The collector does not indicate the colour of the flowers; they appear to be yellow with a crimson-purple tube but may well have had a white limb. The plant is clearly closely related to *I. sulphurea* Hochst. ex Choisy and *I. leucanthemum* (Klotzsch) Hallier f., the variation in the leaf bases on one plant and the structure of the sepals being very similar indeed. Furthermore, a fact which has apparently never before been noted, *I. leucanthemum does have some stellate hairs* along the leaf margins and elsewhere, or rather hairs springing from a common base, together with simple hairs. *Astripomoea* Meeuse has a different facies (sepal shape, uniformly stellate indumentum, etc.) and to place the new species in that genus simply because of the hairs, or to transfer *I. leucanthemum* to it as well, would obscure the correct relationships of these two plants. The sepals clearly fit the subgenus *"Calycanthemum* Klotzsch" of *Ipomoea.* Eventually the correct method of sorting out the tangles in these genera will not be to sink *Astripomoea* into *Ipomoea*

but to subdivide *Ipomoea*. I refuse to do this on a study of African plants alone. There are in any case certain extra-African species with conspicuous stellate indumentum which are invariably referred to *Ipomoea*.

The nomenclature of the various botanical types is not logical. In Zoology the holotype is an individual, in botany it is a sheet—a duplicate of the original individual ceases to be a holotype but an isotype, but the original *individual* is the holotype and any part of it is part of the holotype. "Isotype" must therefore be reserved for a duplicate of the holotype. In the case of a small annual where some 30 specimens may, or at least should, be collected under one collector's number a number of individuals together become a holotype! So in botany the word isotype can mean part of the original holotype or a different individual altogether. I suggest that for small annuals the word paratype be used as in Zoology. One specimen becomes the holotype even though the sheet contains several specimens; all the rest of the individuals in the gathering are paratypes. It is the actual plant that decides the term not a piece of mounting paper.

RHYNCHOSPORA: NOTES ON THE SPECIES OCCURRING IN RHODESIA AND NYASALAND

by

E. A. Robinson

Kasama, Northern Rhodesia

The aim of these notes is a limited and practical one. It is to summarize the present records of the species of this genus hitherto known to occur in this area, and to mention some critical points which further collection and field study should help to elucidate. I have not attempted to give a full or systematic account of the various species or of the characters common to the genus, and in the descriptions only those points appear which are essential for the recognition and distinction of the species.

Since the appearance of Volume 8 of the Flora of Tropical Africa in 1902, the only publication dealing with the species of *Rhynchospora* from this area has been Dr. C. K. Brain's "Key to the Sedges of Southern Rhodesia" (Proc. Rhod. Sci. Assn. Vol. 38, 1934), in which four species (*R. candida, R. cyperoides, R. angolensis* and *R. glauca)* are described as occurring in that Territory. Much more collection of this genus is needed before an adequate account of the distribution of our local species can be drawn up.

The specimens quoted below are arranged according to the geographical divisions adopted in the "Flora Zambesiaca". As I have tried to make the list of records as complete as possible, dates of collection are omitted and information about localities is much abbreviated. As a rule only the district is given, except where some natural feature, e.g., the Nyika Plateau, is better known. I have seen all the specimens which I quote. There must be omissions in the records, as there are some important collections, e.g., those of R. E. Fries and T. C. E. Fries, Norlindh and Weimarck, of which I have not seen complete material.

The key which follows is a purely practical one, and takes no account of the subgenera and other divisions in which the genus has been variously arranged in the past, as these are of little relevance to the study of the relatively few species that occur in Africa.

KEY TO THE SPECIES

1. Plants perennial:

    2. Spikelets when fresh pure white . . . . 1. *R. candida*

    2. Spikelets when fresh green, brown or straw-coloured:

3. Inflorescence composed of 1 or more globose heads, each of many green or straw-coloured spikelets . . . . . 2. *R. mauritii*

3. Inflorescence not composed of globose heads; spikelets brown, ± loosely arranged in a panicle:

4. Leaves 1 cm. or more broad; spikelets very numerous (more than 100 in each panicle) . . . . . 3. *R. corymbosa*

4. Leaves less than 1 cm. broad; spikelets generally fewer than in the foregoing:

5. Rootstock stoloniferous; inflorescence erect at maturity; plants stout, with leaves up to 9 mm. broad . . . . 4. *R. triflora*

5. Rootstock not stoloniferous; inflorescence nodding or drooping at maturity; plants rather slender, with leaves not more than 3.5 mm. broad ("*R. glauca* Vahl" agg.):

6. Hypogynous bristles 0, or reduced to 1 or 2 rudimentary ones . . . 5. *R. juncea*

6. Hypogynous bristles 5 or 6 (more in exceptional cases?), ± well developed:

7. Hypogynous bristles all about the same length, and as long as or longer than the nut and style-base together . . . . . 7. *R. africana*

7. Hypogynous bristles of unequal lengths, and some much shorter than the nut and style-base together:

8. Nut transversely rugose . . . 5. *R. brownii*

8. Nut smooth . . . . . 8. R. sp.

1. Plants annual:

9. Nut smooth . . . . . 9. *R. brevirostris*

9. Nut transversely rugose:

10. Nut finely rugose, white or grey; rhachilla markedly sinuous . . . . . 11. *R. subquadrata*

10. Nut coarsely rugose, grey brown or blackish; rhachilla not sinuous . . . . 10. *R. perrieri*

1. **Rhynchospora candida** (Nees) Boeck. in Linnaea **37**: 605 (1873).

Psilocarya candida Nees in Mart., Fl. Bras. **2**: 117 (1842).

An erect perennial with stems up to 75 cm. tall bearing a ± simple terminal corymb of pure white ovoid spikelets.

Habitat: Boggy places with soils ranging from acid to highly calcareous. A common and conspicuous plant in areas of more than 35″ of rain annually, but not confined to such regions.

NORTHERN RHODESIA. N: Abercorn Distr.: *Siame* 264; *Mrs. Richards* 370, 576, 598, 626, 1536, 4158, 4177, 8150. Chinsali Distr.: *Greenway* H/38/38; *Robinson* 1552. Fort Rosebery Distr.: *Robinson* 2257; *Seagrief* CAH 2276. Kawambwa Distr.: *Robinson* 2333. Mporokoso Distr.: *Vesey-FitzGerald* 1220. W: Chingola Distr.: *Ferrar* s.n. (Rhod. Mus. No. 4792). Kitwe Distr.: *Fanshawe* 4285. Mufulira Distr.: *Eyles* 8044, 8339. Mwinilunga Distr.: *Milne-Redhead* 3258. Ndola Distr.: *Fanshawe* 4083. C: Mkushi Distr.: *Robinson* 2702. B: Balovale Distr.: *West 3508*. Senanga Distr.: *West* 3270; *Codd* 7303.

SOUTHERN RHODESIA. N: Sebungwe Distr.: *Phipps* 1473. W: Matopos Distr.: *Eyles* 1151; *Miller* 4039, 4194. C: Marandellas Distr.: *Brain* 4357, 4359, 4360, 4363.

NYASALAND. C: Kota Kota Distr.: *Jackson* 1095. S: Shire Highlands: *Buchanan* 5. Zomba Distr.: *Lawrence* 252.

Widely distributed throughout Tropical Africa and the Mascarene Islands; also in Tropical South America.

2. **Rhynchospora mauritii** Steud., Syn. Pl. Glum. II Cyper.: 149 (1855).

R. cyperoides (Swartz) Mart., sec. C. B. Clarke in F. T. A. **8**: 479, Kükenth. in Engl., Bot. Jahrb. **74**: 431 (1949) non (Swartz) Mart.

An erect perennial with stems up to 100 cm. tall and slender rhizomes covered with numerous whitish scales, easily distinguished from any other African member of the genus by its inflorescence either of a single sessile or up to 5 pedicelled terminal globose heads, 1 to 1.5 cm. in diameter, of greenish or straw-coloured spikelets. In relatively drier situations, such as both its known Northern Rhodesian stations, only one head is developed, which is sessile, with the bract appearing to form a continuation of the stem, as often in *Scirpus*. In wetter places, such as the "Rain Forest" at the Victoria Falls, several heads are produced.

Habitat: Dambos and boggy places which remain wet for most of the year.

NORTHERN RHODESIA. W: Ndola Distr.: *Jackson* 32; *Robinson* 3438. S: Livingstone Distr.: *Robinson* 1456.

SOUTHERN RHODESIA. W: Victoria Falls: *Rogers* 5419; *Wild* 3190; *Robinson* 1048.

For so conspicuous a plant, widely distributed throughout Tropical and South Africa, the records in our area are strangely few.

3. **Rhynchospora corymbosa** (L.) Britt. in Trans. N. Y. Acad. Sci. **11**: 84 (1892).

Scirpus corymbosus L., Amoen. Acad. **4**: 303 (1760).

Rhynchospora aurea Vahl, Enum. Pl. **2**: 229 (1806).

A robust perennial growing to a height of 1.5 m., easily distinguished from all other African species (except sometimes *R. triflora*) by its broad leaves (up to 1.5 cm.) and its copious panicle of chestnut-brown spikelets. The style-base is broad at the base and only gradually narrowed to a stout tip; it is grooved longitudinally down the centre of each side.

Habitat: Very wet places along streams or on the edge of permanent swamps, and confined in our area at least to districts with an annual rainfall of over 40″.

NORTHERN RHODESIA. N: Chinsali Distr.: *Greenway* 5454; *Mrs. Richards* 10752; *Robinson* 3220. Mporokoso Distr.: *Mrs. Richards* 12424. W: Mwinilunga Distr.: *Milne-Redhead* 3391. Mufulira Distr.: *Robinson* 3429. Solwezi Distr.: *Milne-Redhead* 1146.

SOUTHERN RHODESIA. E: Chipinga Distr.: *Obermeyer* 2299; *Rattray* 1082, 1203.

Pantropical.

4. **Rhynchospora triflora** Vahl, Enum. Pl. **2**: 232 (1806).

A stout perennial growing to a height of 1 m. Well-developed examples come fairly close in appearance to small plants of *R. corymbosa*, from which this species can usually be distinguished by the narrower leaves (3-9 mm. wide), the less copious inflorescence in which the spikelets do not form dense masses but are borne erect in distinct groups of 3 to 9 on long pedicels, and by the style-base, which is narrowed shortly above the base to a slender tip, and is not longitudinally grooved. The glumes are also of a darker brown in this species than in *R. corymbosa*.

Habitat: Spongy bogs.

NORTHERN RHODESIA. N: Fort Rosebery Distr.: *Robinson* 1747. Kasama Distr.: *Vesey-FitzGerald* 1680. Kawambwa Distr.: *Robinson* 2361.

Also in West Africa, Angola, the Belgian Congo and Tropical Asia. Not yet apparently recorded from any East African territory.

5. **Rhynchospora brownii** Roem. et Schult., Syst. Veg. **2**: 86 (1817).

R. laxa R. Br., Prodr. Fl. Nov. Holl.: 230 (1810), non Vahl.

R. glauca Vahl sec. C. B. Clarke in F. T. A. **8**: 482, Kükenth. in Engl., Bot. Jahrb. **75**: 143 (1950), non Vahl.

An erect but slender perennial with stems 30 to 100 cm. tall and a ± copious inflorescence in the form of a lax panicle, always drooping at maturity, of many bright castaneous or dark brown spikelets each 3 to 4.5 mm. long and maturing 1 to 2 nuts. The achene varies considerably in shape and colour. Apart from the greyish style-base, which is merged with the body of the nut by a pale girdling ridge, it ranges from very pale yellow-brown to a rich reddish castaneous. In shape the main body of the nut varies from broadly ovate to suborbicular. Its length is from 1.3 to 1.8 mm. The surface is finely transversely rugose. The hypogynous bristles are usually 6 but 1 or more may be missing; they are irregular in length and are generally shorter than the nut and style-base together.

Habitat: Bogs, banks of streams and rivers, and other places which remain wet for the greater part of the year.

NORTHERN RHODESIA. N: Chinsali Distr.: *Robinson* 1533. Fort Rosebery Distr.: *Robinson* 2300. W: Luanshya Distr.: *Robinson* 3358. Ndola Distr.: *Robinson* 2225 p.p. C: Mkushi Distr.: *Robinson* 2623. E: Nyika Plateau: *Robinson* 3006.

SOUTHERN RHODESIA. W: Matopos Distr.: *Brain* 7666, 7669. C: Marandellas Distr.: *Brain* 4343, 4344; *Corby* 546. Salisbury Distr.: *Robinson* 1806. E: Inyanga Distr.: *T. C. E. Fries* 2749; *Robinson* 1870. Chimanimani Distr.: *Phipps* 360, 405.

NYASALAND. N: Mafingi Hills: *Robinson* 2983. Nyika Plateau: *Robinson* 3038. S: Zomba Distr.: *Whyte* s.n.

Also in Uganda, Tanganyika, the Belgian Congo and South Africa, as well as in Tropical Asia and Australia. Material of the Type number at Kew (*Brown* 5994) is matched in all particulars by typical Rhodesian specimens, e.g., *Robinson* 2300.

6. **Rhynchospora juncea** Willd. ex Kunth, Enum. Pl. **2**: 298 (1837), s.v. *R. laxa* R. Br.

R. glauca Vahl var. *juncea* (Willd. ex Kunth) Cherm. in Bull. Soc. Bot. Fr. **74**: 608 (1927).

An erect perennial similar in habit and general appearance to *R. brownii*, from which it differs in the absence of hypogynous bristles (occasionally one or two rudimentary ones may be seen), and in the nut, which, at least in the examples quoted below, is slenderer than in *R. brownii*, with the main body 1.6 to 1.8 mm. long and merged

directly into the style-base without the pale girdling ridge which is always present in that species. (Chermezon, however, in his description of his var. *juncea* (l.c. above) says that the nut is more broadly obovoid than in *R. glauca* proper.) This plant must be considered very doubtfully distinct from *R. brownii*.

Habitat: Both the numbers given below were collected on the shores of Lake Chila, whose variations of level sometimes leave extensive patches of sand and mud at the water's edge.

NORTHERN RHODESIA. N: Abercorn Distr.: *Matafwali* 11; *Robinson* 1637.

Apart from these gatherings, the species appears only to have been found in Mauritius and Madagascar.

7. **Rhynchospora africana** Cherm. in Arch. Bot. Caen **4**, Mem. No. 7: 44 (1931).

R. glauca Vahl subsp. *chinensis* (Boeck.) C.B.Cl. var. *africana* (Cherm.) Kükenth. in Engl., Bot. Jahrb. **75**: 149 (1950).

A tall slender erect perennial differing from *R. brownii* in height, size of inflorescence and spikelets, nut and hypogynous bristles. The stems may be up to 120 cm. tall. The inflorescence is a good deal less copious than in *R. brownii*, being usually composed of from 2 to 12 spikelets arranged in a loose interrupted panicle which, though hardly rigid, is less drooping than is usual in mature examples of *R. brownii*. The spikelets are 4 to 8 mm. long, and mature 2 to 4 nuts. The nut is elliptic-ovate to ovate and similar in colour and surface texture to that of *R. brownii*, with the main body 1.4 to 2 mm. long. The hypogynous bristles are 5 to 6, usually 6, ± equal in length and generally about as long as or longer than the nut and style-base together.

Habitat: Spongy bogs with ± perennial seepage.

NORTHERN RHODESIA. N: Abercorn Distr.: *Mrs. Richards* 12448. Chinsali Distr.: *Greenway* 5445; *Robinson* 1539, 1596, 1625. Fort Rosebery Distr.: *Robinson* 2268. Kasama Distr.: *Robinson* 3743. Kawambwa Distr.: *Robinson* 2362. W: Chingola Distr.: *Robinson* 3407. Mwinilunga Distr.: Milne-Redhead 3615. Ndola Distr.: *Robinson* 2225 p.p. C: Mkushi Distr.: *Robinson* 2617. B: Mongu Distr.: *Trapnell* 1299.

SOUTHERN RHODESIA. C: Marandellas Distr.: *Corby* 332, 444. E: Chimanimani Distr.: *Goodier & Phipps* 231.

Also in Oubangui-Chari, Uganda, Tanganyika and Madagascar.

8. **Rhynchospora sp.**

A species closely related to *R. brownii* but distinguished from it by the nut, which is yellowish and almost entirely smooth. The leaves are setaceous, and the inflorescence is somewhat more strict than is usual in *R. brownii*. (In this latter character it resembles *R. angolensis* Turrill, another closely related species chiefly notable for its long nut, the main body of which is up to 2.5 mm. long, and its hypogynous bristles, which are 6 mm. long. It is only known from the Type collection from Benguella in Angola (Gossweiler 3268), but may well occur in Rhodesia.)

NORTHERN RHODESIA. W: Mwinilunga Distr.: *Milne-Redhead* 3572.

A very similar plant to the above has been found in the Belgian Congo (Germain 8381). In this the nut surface is similar, but the nut itself is smaller. The leaves are broader (up to 2 mm.), and the inflorescence is of the elongate and laxer kind typical of *R. brownii*.

Note on Species 5 to 8

Kükenthal (loc. cit. s.v. *R. brownii* above) was of the opinion that the various species into which *R. glauca* Vahl has been split should not be maintained, and he united them in a single species. In this he may be right. Unfortunately for this aggregate he retained the name *R. glauca* Vahl. This name is invalid; for when Vahl published his name and description of *R. glauca* (Enum. **2**: 233 (1806)) he gave in synonymy his earlier name of *Schoenus rugosus*, which he had published eight years previously (Ecl. Amer. **2**: 5 (1798)). This was pointed out by Miss Shirley Gale (Rhodora **46**: 275 (1944)), who has made it clear that the correct name for Vahl's plant is *Rhynchospora rugosa* (Vahl) Gale. This combination was admitted by Kükenthal to be "nach den Regeln korrekt", but he still pleaded for the retention of the later name.

It may therefore be that the species numbered 5 to 8 above, along with *R. angolensis*, should be considered as no more than varieties of *R. rugosa* (Vahl) Gale. However, Miss Gale (loc. cit.) maintained that the American plants known to Vahl are not conspecific with the Asian and Australian ones to which the name *R. glauca* had also previously been given (she makes no mention of African specimens). The Tropical American plants, to which Miss Gale would restrict this name, do have a slightly smaller and slenderer nut than the average African ones of this group, which are described under *R. brownii* above; but the latter are so variable that it is not impossible to find examples from Africa whose nuts are barely distinguishable in shape and size from those of the American plants. Colour, too, is an unreliable character. It is true that the American specimens seem to lack the reddish or castaneous nuts that occur commonly on those from Africa and Asia—the colour is given by the finely red-pitted surface—but examples can be found in Africa which are quite as pale as those from Brazil or Paraguay. A

more reliable feature of the American plants may prove to be the hypogynous bristles, which are regularly of the same length and exceed the nut and style-base. In this feature, as in all others, the specimens at Kew from the Mascarene Islands (such as *H. H. Johnston* s.n., Curepipe, 21.xii.88, and *Vaughan* B.24 from Mauritius, *Balfour* s.n. from Bourbon, and *Baron* 1003, 1004 from Madagascar) seem perfectly to match the American *R. rugosa*. This curious fact was observed by Nelmes, who in general accepted Miss Gale's views and in an unpublished account of the genus prepared for the Flora of East Tropical Africa adopted the name *R. brownii* Roem. et Schult. for the common East, Central and South African plant previously known as *R. glauca* Vahl. However, distinctions based on the size of hypogynous bristles cannot bear very much weight in this genus (cf. in this *R. minor* Nelmes); and in general it is doubtful whether the American *R. rugosa* can be considered specifically distinct from some at least of the plants of this group which grow in Africa and Asia. More material must come in before the true status of all the African species can be assessed.

9. **Rhynchospora brevirostris** Grisebach in Cat. Pl. Cub.: 246 (1866).

R. barteri C. B. Cl. in Dur. et Schinz, Consp. Fl. Afr. 653 (1894) (nomen); in F.T.A. 8: 482 (1902).

A slight erect tufted annual with stems from 3 to 20 cm. tall and an inflorescence of 1 terminal and 1 to 3 lateral corymbs composed each of 3 to 12 brownish spikelets each about 3 mm. long. The nut, which is ovate to suborbicular, is smooth and shiny, and varies in colour from pale grey to black. The style-base is not or only barely apiculate. The centre of each side of the nut is generally darker than the edges, and the base usually has a rusty appearance due to the presence of 2 rough, minutely scaly patches on each side. These sometimes converge to form a single zone round the base; sometimes they are almost absent. Kükenthal (Engl., Bot. Jahrb. **75**: 284ff.) distinguishes *R. brevirostris* from *R. barteri* on the density of the corymbs, the size of the spikelets, and the supposed absence (in *R. barteri)* of these patches, which he describes as "calli scrobiculati". After examining Clark's type *(Barter* 1010, from Nigeria) and Brazilian material quoted by Kükenthal for *R. brevirostris* (e.g. Regnell 1588, 3463) I can see no significant differences in any of the characters he mentions. It is true that the "calli" are not conspicuous in Barter's plants, but nor are they in some American ones. The Rhodesian material shows a good deal of variation in this character; the "calli" are conspicuous in *Robinson* 2316 and 2850, but very much less so in 3587 and 3599. But in fact the variation within each gathering is too great for this feature to have much value.

Habitat: Damp sandy or muddy places where there is little competition from strong-growing grasses, on both acid and fairly calcareous soils, in areas of moderately high (45-55 in.) and relatively low (30 in.) annual rainfall.

NORTHERN RHODESIA: N: Kasama Distr.: *Robinson* 3739. W: Mwinilunga Distr.: *Robinson* 3587, 3599. S: Choma Distr.: *Robinson* 2850.

Apart from Tropical America, only known to me from these four gatherings, from Nigeria (the Type), and the Songea District of Tanganyika.

10. **Rhynchospora perrieri** Cherm. in Bull. Soc. Bot. Fr. **69:** 721 (1922).

R. deightonii Hutch. in Hutch. et Dalz. Fl. W. Trop. Afr. **2**: 468 (1936).

A tufted, generally weakly erect annual with stems from 3 to 74 cm. tall. The inflorescence in general appearance resembles that of *R. brevirostris*. The spikelets of *R. perrieri* are however usually larger (4 to 5 mm. long) and the whole plant is somewhat stouter. The nut is quite distinctive, being coarsely transversely rugose and varying in colour from pale brown or olive green to brownish or greenish black. The style-base is markedly apiculate in the centre.

Habitat: As for the previous species, but *R. perrieri* can also grow in competition with a fairly thick growth of grasses and other sedges, where it can easily be overlooked.

NORTHERN RHODESIA: W: Chingola Distr.: *Robinson* 3698. Ndola Distr.: *Robinson* 2222.

SOUTHERN RHODESIA: W: Victoria Falls: *Robinson* 1418.

Frequently collected in West Africa from Sierra Leone to Oubangui-Chari; known also from Pemba Island and Madagascar.

11. **Rhynchospora subquadrata** Cherm. in Bull. Soc. Bot. Fr. **69:** 720 (1922).

A weakly erect, usually densely tufted annual with slender stems 15 to 70 cm. tall and a much elongated inflorescence consisting of 1 terminal and up to four lateral loosely arranged corymbs. Spikelets pale castaneous, from 5 to 9 mm. long, each ripening up to 4 nuts, with a markedly sinuous or serpentine ranchilla which after maturity turns black and is about the only conspicuous feature of the plant. The nut is white or grey, quadrate-orbicular, and slenderly transversely rugose.

Habitat: Dambos and other places which remain damp for the greater part of the year. This species can stand competition with dense growth of other vegetation, and often occurs in lush grassland where it grows very lanky and is hard to see.

NORTHERN RHODESIA: N: Abercorn Distr.: *Robinson* 1687. Fort Rosebery Distr.: *Robinson* 1754. Kasama Distr.: *Mrs. Richards* 12533, *Robinson* 3747. Kawambwa Distr.: *Robinson* 2396. W: Chingola Distr.: *Robinson* 3408. Luanshya Distr.: *Robinson* 3318. Ndola Distr.: *Robinson* 2223, 2229.

SOUTHERN RHODESIA: W: Matopos Distr.: *Miller* 5243.

Also found in French Guinea, Ghana, Nigeria, the Belgian Congo, Uganda, Tanganyika and Madagascar.

An extremely similar species, *R. gracillima* Thwaites, occurs in India and Ceylon. The material of the Type *(Thwaites* 3818) at Kew differs in no particular from typical African specimens (e.g. *Robinson* 2229, 2396) except for the transverse corrugations on the nut. In *R. gracillima* there are from 6 to 8 of these on each side of the nut, in *R. subquadrata* from 10 to 12; in the former species they are somewhat coarser and deeper than in the latter. As both species appear to be consistent in these characters they must doubtless both be maintained. Intermediate forms should be looked for.

Rhynchospora erinacea (Ridl.) C.B.Cl., in Dur. et Schinz, Consp. Fl. Afr. **5:** 654 (1895).

Schoenus erinaceus Ridl. in Trans. Linn. Soc. Ser. 2, **2:** 165 (1884).

Cyperus erinaceus (Ridl.) Kükenth in Boissiera **7**: 100 (1943).

This curious plant, which is locally common in two widely separated areas of Northern Rhodesia (N: Abercorn Distr.: *Mrs. Richards* 498, 853, 1230, 4650; W: Mwinilunga Distr.: *Milne-Redhead* 4615; *Robinson* 3553) is not a *Rhynchospora*. It has, pace Clarke in F.T.A. **8**: 479, 3-fid styles. Its proper genus is doubtful.

SUMMARY

The preponderance of records of this genus from the wetter Northern and Western Provinces of Northern Rhodesia may to some degree reflect the distribution not so much of species as of collectors. However, a number of these records were made by a collector normally resident in the drier Southern Province, from which only two species have hitherto been recorded, each represented by a single collection. It seems probable that this genus is most commonly to be found in the areas of of high annual rainfall, though the occurrence of certain species, most notably *R. subquadrata*, in the relatively dry Matopos area of Southern Rhodesia suggests that the distribution pattern of many species is still most imperfectly known.

REFERENCES

Brain, C. K. (1934), A Key to the Sedges (Cyperaceae) of S. Rhodesia. *Proc. Rhod. Sci. Ass.* **38**.

Clarke, C. B. (1902), *Flora of Tropical Africa* **8**: 478-483. Reeve & Co., London.

Gale, S. (1944), Rhynchospora Sect. Eurhynchospora in Canada, the United States and the West Indies. *Rhodora* **46.**

Kükenthal, G. (1950-2), Vorarbeiten zu einer Monographie der Rhynchosporideae. *Engl., Bot. Jahrb.* **75.**

Fig. 1

Distribution of *Rhynchospora corymbosa*, *R. triflora* and *R. subquadrata* in Rhodesia and Nyasaland

□ R. corymbosa

■ R. triflora

△ R. subquadrata

Fig. 2

R. candida

R. brownii

R. africana

Distribution of *Rhynchospora candida*, *R. brownii* and *R. africana* in Rhodesia and Nyasaland

A REVISED CHECK-LIST OF THE VASCULAR PLANTS OF THE CHIMANIMANI MOUNTAINS

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INTRODUCTORY NOTE

The amount of information which has now accrued relating to the Southern Rhodesian flora, together with the current publishing of the "Flora Zambesiaca", should, in the opinion of the authors, make this paper timely. As with all check-lists, this one cannot hope to be a last word, but nevertheless the 859 species listed should prove an interesting and valuable aid to students of the Southern Rhodesian and Moçambique floras, as well as to those interested in the phytogeography of the belt of mountains stretching along the eastern side of Africa from Abyssinia in the north to Cape Province in the South. As this number of taxa comes from an area of less than 200 square miles it will be seen that the flora of the Chimanimani Mountains is fairly well known compared with other areas of comparable size within the tropics.

For the purposes of this paper we have delimited the Chimanimani Mountains principally on a geological basis. Thus this check-list is applicable to the mountainous area derived from the Frontier System (see map) lying to the east of Melsetter. As the authors' interest has primarily been in this flora as a montane one, the taxa cited are only those occurring above an altitudinal base line of 4,000 ft. ($\pm$ 1,200 m.).

In the list which follows the classification into categories the rank of class and above is that of Tippo (1942), while the arrangement of the families and genera follows Copeland (1947) for the ferns and De Dalla Torre and Harms (1900-1907) for the Spermatophyta. Hutchinson (1959) is followed in treating the Strelitziaceae, Smilacaceae, Hypoxidaceae, Molluginaceae, Hypericaceae, Menyanthaceae, Buddlejaceae, Strychnaceae, Selaginaceae, Lentibulariaceae and Lobeliaceae as separate families. Pilger's (1954) arrangement of tribes and genera has been adopted in the Gramineae. The whole classification is thus that employed at the Federal Herbarium, Salisbury (SRGH). For convenience, individual species are arranged alphabetically under their genera.

The source material for the check-list is that residing in the Federal Government Herbarium. Most of this has been collected since World War II, but it also includes a proportion of Swynnerton specimens

collected in the early years of this century. The great bulk of this material was collected in the Southern Rhodesian part of the Chimanimani Mountains, but the authors' own observations and collections indicate that the check-list will be largely applicable to the whole of the area. In this respect it should be noted that all the different major habitats represented in the mountains have been fairly thoroughly collected with the exception of the evergreen forest where the physical difficulties in collecting from tall trees contribute to making it the least known habitat.

Many of the genera treated have no recent revision applicable to south tropical Africa and therefore the authors have considered it useful to include unnamed species. As the authors have decided to cite a typical gathering in all possible cases, a straightforward system is provided for correcting and completing names at a later date as our knowledge of the taxa concerned improves and relevant revisions come to hand. The names themselves are the best at present available at the Federal Herbarium and should be checked by users of this list against those in the "Flora Zambesiaca" as parts of the latter are published.

The authors' gratitude is due in great measure to their colleague, Mr. R. B. Drummond, whose suggestions at all stages have been invaluable and who has undertaken the painstaking task of checking the manuscript. The authors also wish to thank Dr. H. Wild for his help in checking the manuscript. Finally, it should be noted that the list of names in the Orchidaceae could not be what it is but for the kind help given by Mr. F. C. Greatrex and Mr. J. S. Ball, while the length of the cryptogamic section is in large measure due to the excellent collections of Mr. D. S. Mitchell.

LYCOPSIDA

LYCOPODIALES

	Collector	*Coll. No.*
1. Selaginellaceae		
Selaginella abyssinica Spring	J. B. Phipps	331
Selaginella dregei (Presl) Hieron.	J. B. Phipps	SRGH 77206
Selaginella kraussiana (Kunze) A. Braun	C. F. M. Swynnerton	805
Selaginella mittenii Bak.	D. S. Mitchell	410
2. Lycopodiaceae		
Lycopodium carolinianum L.	H. Wild	2927
Lycopodium cernuum L.	J. B. Phipps	277
Lycopodium clavatum L.	D. S. Mitchell	348
Lycopodium dacrydioides Bak.	D. S. Mitchell	343
Lycopodium gnidioides L.f.	H. Wild	2891
Lycopodium ophioglossoides Lam.	D. S. Mitchell	503
Lycopodium sarcocaulon A. Braun & Welw. ex Kuhn	D. S. Mitchell	227
Lycopodium verticillatum L.f.	H. Wild	2953

PTEROPSIDA

OPHIOGLOSSALES

	Collector	Coll. No.
1. Ophioglossaceae		
Ophioglossum sarcophyllum Desv.	R. Goodier & J. B. Phipps	280

MARATTIALES

1. Marattiaceae		
Marattia fraxinea Sm.	D. S. Mitchell	329

FILICALES

1. Osmundaceae		
Osmunda regalis L.	H. C. Taylor	1746
Todea barbara (L.) Moore	H. Wild	2957
2. Schizaeaceae		
Mohria caffrorum (L.) Desv.	R. H. Finlay	SRGH 12771
Mohria lepigera (Bak.) Bak.	C. F. M. Swynnerton	611a
3. Gleicheniaceae		
Gleichenia polypodioides (L.) Sm.	C. F. M. Swynnerton	676
Sticherus umbraculiferus (Kunze) Ching	D. S. Mitchell	280
5. Hymenophyllaceae		
Hymenophyllum capillare Desv.	D. S. Mitchell	530
Hymenophyllum fumarioides Willd.	D. S. Mitchell	339
Hymenophyllum kuhnii C. Chr.	D. S. Mitchell	323
Hymenophyllum sibthorpioides Mett.	D. S. Mitchell	321
Hymenophyllum tunbridgense (L.) Sm.	J. B. Phipps	658
Trichomanes borbonicum v.d.B.	N. C. Chase	3053
Trichomanes cupressoides Desv.	N. C. Chase	3054
Trichomanes erosum Willd. var. *chamaedrys* (Taton) Tardieu-Blot	D. S. Mitchell	320
Trichomanes melanotrichum Schlechtend.	D. S. Mitchell	286
6. Pteridaceae		
Lindsaya sp. cf. *L. cultrata* (Willd.) Sw.	J. S. Ball	695
Pteridium aquilinum (L.) Kuhn	D. S. Mitchell	346
Pteris linearis Poir.	D. S. Mitchell	304
Pteris cretica L.	D. S. Mitchell	302
Pteris imbricata C. H. Wright	J. S. Ball	683
Lonchitis natalensis Hook.	N. C. Chase	3051
Lonchitis stenochlamys Fée	D. S. Mitchell	395
Cheilanthes multifida Sw.	R. H. Finlay	SRGH 12669
Notholaena buchananii Bak.	J. B. Phipps	324
Pellaea calomelanos (Sw.) Link	D. S. Mitchell	299
Pellaea doniana Hook.	D. S. Mitchell	330
Pellaea goudotii (Kunze) C. Chr.	N. C. Chase	3029
Pellaea quadripinnata (Forsk.) Prantl	C. F. M. Swynnerton	852
Pellaea swynnertoniana Sim	N. C. Chase	3021
Pellaea viridis (Forsk.) Prantl	D. S. Mitchell	330
Pityrogramma argentea (Willd.) Domin	J. A. Whellan	1262
Adiantum mendoncae Alston	D. S. Mitchell	404
Adiantum thalictroides Schrad.	D. S. Mitchell	524

		Collector	Coll. No.
9.	**Davalliaceae**		
	Oleandra distenta Kunze	H. Wild	2863
	Nephrolepis tuberosa (Bory) Presl	D. S. Mitchell	310
	Nephrolepis undulata (Afzel. ex Sw.) J. Sm.	J. B. Phipps	473
	Arthopteris orientalis (Gmel.) Posth.	D. S. Mitchell	233
	Arthopteris monocarpa (Cordem.) C. Chr.	D. S. Mitchell	305
11.	**Cyatheaceae**		
	Cyathea capensis (L.f.) Sm.	D. S. Mitchell	328
	Cyathea dregei Kunze	J. B. Phipps	287
12.	**Aspidiaceae**		
	Elaphoglossum angustatum (Schrad.) Hieron.	H. Wild	2946
	Elaphoglossum aubertii (Desv.) Moore	J. A. Whellan	1530
	Elaphoglossum conforme (Sw.) Schott var.	J. B. Phipps	656
	Elaphoglossum kuhnii Hieron.	D. S. Mitchell	529
	Elaphoglossum lastii Bak.	N. C. Chase	3014
	Dryopteris athamantica (Kunze) Kuntze	J. B. Phipps	379
	Dryopteris kilimensis (Kuhn) C. Chr.	J. B. Phipps	471
	Dryopteris sp. ? *D. manniana* (Hook.) C. Chr.	D. S. Mitchell	307
	Dryopteris pentheri (Krass.) C. Chr.	J. B. Phipps	459
	Dryopteris sp. ? *D. pseudogueintziana* Bonap.	D. S. Mitchell	306
	Dryopteris sp.	D. S. Mitchell	527
	Thelypteris palustris Schott	J. B. Phipps	373
	Cyclosorus dentatus (Forsk.) Ching	D. S. Mitchell	505
	Athyrium scandicinum (Willd.) Presl	N. C. Chase	3052
13.	**Blechnaceae**		
	Blechnum attenuatum (Sw.) Mett.	N. C. Chase	3015
	Blechnum tabulare (Thunb.) Kuhn	J. B. Phipps	313
14.	**Aspleniaceae**		
	Asplenium aethiopicum (Burm.) Becherer	J. B. Phipps	452
	Asplenium anisophyllum Kunze	N. C. Chase	3013
	Asplenium sp. cf. *A. blastophorum* Hieron.	D. S. Mitchell	381
	Asplenium boltonii Hook.	D. S. Mitchell	341
	Asplenium erectum Bory	D. S. Mitchell	511
	Asplenium friesiorum C. Chr.	C. F. M. Swynnerton	857
	Asplenium gracile Pappe & Raws.	D. S. Mitchell	506
	Asplenium mannii Hook.	D. S. Mitchell	314
	Asplenium monanthes L.	D. S. Mitchell	308
	Asplenium obscurum Blume	D. S. Mitchell	405
	Asplenium protensum Schrad.	D. S. Mitchell	523
	Asplenium rutifolium (Berg.) Kunze	D. S. Mitchell	282
	Asplenium sandersonii Hook.	D. S. Mitchell	324
	Asplenium stuhlmannii Hieron.	D. S. Mitchell	267
	Asplenium sp.	D. S. Mitchell	525
	Loxoscaphe theciferum (Kunth) Moore	D. S. Mitchell	344
16.	**Polypodiaceae**		
	Polypodium excavatum Bory	N. C. Chase	3056
	Polypodium magellanicum (Desv.) Copeland	D. S. Mitchell	364
	Polypodium schraderi Mett.	D. S. Mitchell	334
	Xiphopteris rigescens (Bory) Alston	J. B. Phipps	657
	Pleopeltis lanceolata (L.) Kaulf.	D. S. Mitchell	232
	Loxogramme lanceolatum (Sw.) Presl	D. S. Mitchell	298

		Collector	Coll. No.
17.	**Vittariaceae**		
	Vittaria isoetifolia Bory	C. F. M. Swynnerton	802
	Vittaria volkensii Hieron.	D. S. Mitchell	325
	GYMNOSPERMAE		
1.	**Cycadaceae**		
	Encephalartos manikensis (Gilliland) Gilliland	R. C. Munch	444
5.	**Taxaceae**		
	Podocarpus milanjianus Rendle	C. F. M. Swynnerton	1962
6a.	**Cupressaceae**		
	Widdringtonia whytei Rendle	C. F. M. Swynnerton	1963
	ANGIOSPERMAE		
	MONOCOTYLEDONES		
19.	**Gramineae**		
	Festuceae		
	Poa annua L.	R. Goodier & J. B. Phipps	298
	Festuca costata Nees	R. Goodier	504
	Aveneae		
	Aveninae		
	Koeleria gracilis Pers.	R. Goodier	505
	Danthoniinae		
	Danthonia davyi C. E. Hubbard	R. Goodier & J. B. Phipps	204
	Pentaschistis natalensis Stapf	J. B. Phipps	660
	Arundineae		
	Phragmites communis Trin.	R. Goodier & J. B. Phipps	287
	Arundinelleae		
	Trichopteryx dregeana Nees	R. Goodier & J. B. Phipps	57
	Trichopteryx stolziana Henr.	J. B. Phipps	688
	Loudetia simplex (Nees) C. E. Hubbard	J. B. Phipps	270
	Tristachya eylesii Stent & Rattray	J. B. Phipps	481
	Tristachya hispida (L.f.) K. Schum.	R. Goodier & J. B. Phipps	291
	Danthoniopsis pruinosa C. E. Hubbard	J. B. Phipps	(seen only)
	Danthoniopsis sp.	D. C. Plowes	1242
	Eragrosteae		
	Eragrostinae		
	Eragrostis caniflora Rendle	R. Goodier & J. B. Phipps	193
	Eragrostis capensis (Thunb.) Trin.	J. B. Phipps	242
	Eragrostis longepaniculata De Wild.	J. B. Phipps	328
	Eragrostis racemosa (Thunb.) Steud.	J. B. Phipps	252
	Eragrostis tenuifolia (A. Rich.) Hochst. ex. Steud.	R. Goodier & J. B. Phipps	299
	Eragrostis sp. aff. *E. uniglumis* Hack.	R. Goodier & J. B. Phipps	306
	Eragrostis volkensii Pilg.	R. Goodier & J. B. Phipps	19
	Eragrostis sp. = SRGH 30668	R. Goodier & J. B. Phipps	333
	Eragrostis sp.	R. Goodier & J. B. Phipps	24
	Stiburus alopecuroides (Hack.) Stapf	J. B. Phipps	367
	Eleusine coracana (L.) Gaertn.	G. F. T. Child	11
	Pogonarthria squarrosa (Licht.) Pilg.	R. Goodier & J. B. Phipps	301
	Bewsia biflora (Hack.) Goossens	J. B. Phipps	382
	Crinipes gynoglossa Goossens	R. Goodier & J. B. Phipps	20

	Collector	Coll. No.
Sporobolinae		
Sporobolus centrifugus Nees	R. Goodier & J. B. Phipps	184
Sporobolus sp. aff. *S. festivus* Hochst. ex A. Rich.	J. B. Phipps	338
Sporobolus pyramidalis Beauv.	R. Goodier & J. B. Phipps	297
Sporobolus subtilis Kunth	J. B. Phipps	266
Chlorideae		
Ctenium concinnum Nees	R. H. Finlay . . SRGH	12653
Microchloa caffra Nees	R. Goodier	508
Brachyachne fibrosa C. E. Hubbard	R. Goodier & J. B. Phipps	142
Rendlia altera (Rendle) Chiov.	R. Goodier & J. B. Phipps	143
Chloris pycnothrix Trin.	R. Goodier & J. B. Phipps	295
Pogonochloa greenwayi C. E. Hubbard	N. C. Chase	2979
Aristideae		
Aristida atroviolacea Hack.	J. B. Phipps	269
Aristida eriophora Henr.	R. Goodier & J. B. Phipps	54
Aristida sp. § *Chaetaria*	K. E. Sturgeon . . SRGH	30759
Lappagineae		
Tragus berteronianus Schult.	R. Goodier & J. B. Phipps	296
Paniceae		
Panicum dregeanum Nees	J. B. Phipps	241
Panicum ecklonii Nees	R. Goodier & J. B. Phipps	135
Panicum sp. cf. *P. hochstetteri* Steud.	R. Goodier	997
Panicum ianthum Stapf	J. B. Phipps	357
Panicum inaequilatum Stapf & C. E. Hubbard	J. B. Phipps	317
Panicum sp. § *Verruculosae*	F. R. Williams . . SRGH	30702
Sacciolepis sp. cf. *S. gracilis* Stent & Rattray	R. Goodier & J. B. Phipps	18
Alloteropsis semialata (R. Br.) Hitchc. var. *ecklonii* Stapf	R. Goodier & J. B. Phipps	167
Oplismenus hirtellus (L.) Beauv.	J. B. Phipps	(seen only)
Digitaria diagonalis (Nees) Stapf	J. B. Phipps	381
Digitaria gazensis Rendle	J. B. Phipps	243
Digitaria nitens Rendle	R. Goodier & J. B. Phipps	315
Digitaria setifolia Stapf	R. Goodier & J. B. Phipps	275
Setaria megaphylla (Steud.) Dur. & Schinz	R. Goodier & J. B. Phipps	83
Setaria sphacelata (Schumach.) Stapf & C. E. Hubbard ex M. B. Moss	J. B. Phipps	305
Melinideae		
Rhynchelytrum nyassanum (Mez) Stapf & C. E. Hubbard	R. Goodier & J. B. Phipps	136
Rhynchelytrum repens (Willd.) C. E. Hubbard	J. B. Phipps	257
Rhynchelytrum stuposum Stapf & C. E. Hubbard	R. Goodier	483
Isachneae		
Isachne aethiopica Stapf & C. E. Hubbard	R. Goodier	1002
Andropogoneae		
Eriochrysis brachypogon (Stapf) Stapf	J. B. Phipps	271
Ischaemum arcuatum (Nees) Stapf	J. B. Phipps	296
Urelytrum squarrosum Hack.	J. B. Phipps	414
Elyonurus argenteus Nees	R. Goodier & J. B. Phipps	133
Rhytachne rottboellioides Desv.	R. Goodier & J. B. Phipps	122
Diheteropogon sp.	R. Goodier & J. B. Phipps	139
Cymbopogon validus Stapf ex Burtt Davy	J. B. Phipps	(seen only)
Andropogon eucomus Nees	J. B. Phipps	236
Andropogon huillensis Rendle	J. B. Phipps	272

	Collector	Coll. No.
Andropogon schirensis Hochst.	J. B. Phipps	350
Andropogon tumidulus Stapf	J. B. Phipps	278a
Andropogon sp.	J. B. Phipps	2842
Schizachyrium semiberbe Nees	O. West	3623
Hyparrhenia cymbaria (L.) Stapf	R. Goodier	996
Hyparrhenia newtonii (Hack.) Stapf	G. F. T. Child	18
Hyparrhenia sp.	R. Goodier & J. B. Phipps	3
Monocymbium ceresiiforme (Nees)Stapf	J. B. Phipps	297
Themeda triandra Forsk.	J. B. Phipps	245
Trachypogon spicatus (L.f.) Kuntze	R. Goodier & J. B. Phipps	121

20. Cyperaceae

Ascolepis capensis (Kunth) Ridl.	J. B. Phipps	237
Cyperus albostriatus Schrad.	J. B. Phipps	325
Cyperus denudatus L.f.	J. B. Phipps	374
Cyperus distans L.f.	A. V. Hall	448
Cyperus holostigma Schweinf.	J. B. Phipps	318a
Cyperus margaritaceus Vahl	R. Goodier & J. B. Phipps	134
Cyperus obtusiflorus Vahl	J. B. Phipps	384
Cyperus parvinux C.B.Cl.	J. B. Phipps	294
Cyperus rupestris Kunth	R. Goodier & J. B. Phipps	241
Cyperus sp. aff. *C. rotundus* L.	J. B. Phipps	357
Cyperus tenax Boeck.	J. B. Phipps	345
Cyperus sp.	R. Goodier & J. B. Phipps	140a
Pycreus aethiops Welw. ex Ridl.	J. B. Phipps	237a
Kyllinga cylindrica Nees	A. V. Hall	446
Ficinia stolonifera Boeck.	R. Goodier	495
Fuirena pubescens (Poir.) Kunth	J. B. Phipps	410
Fuirena stricta Steud.	A. R. A. Noel	2051
Scirpus falsus C.B.Cl.	R. Goodier	489
Scirpus sp.	H. Wild	3620
Scirpus sp. = H. Wild 3620	R. Goodier & J. B. Phipps	226
Eleogiton fluitans (L.) Link	J. B. Phipps	279
Bulbostylis burchellii (Fic. & Hiern) C.B.Cl.	G. F. T. Child	6
Bulbostylis collina (Kunth) C.B.Cl.	J. B. Phipps	262
Bulbostylis sp. nr. *B. densa* (Wall.) Hand.-Mazz.	J. B. Phipps	318
Bulbostylis oritrephes (Ridl.) C.B.Cl.	R. Goodier & J. B. Phipps	8
Bulbostylis sp. = SRGH 21207	J. B. Phipps	670
Coleochloa setifera (Ridl.) Gilly	R. Goodier & J. B. Phipps	211
Costularia natalensis C.B.Cl.	H. Wild	4565
Rhynchospora africana Cherm.	R. Goodier & J. B. Phipps	231
Rhynchospora brownii Roem. & Schult.	J. B. Phipps	360
Scleria bulbifera Hochst. ex A. Rich.	R. Goodier	478
Scleria dieterlenii Turrill	J. B. Phipps	327
Scleria sp. ? *S. flexuosa* Boeck.	J. B. Phipps	691
Scleria hirtella (L.) Swartz	J. B. Phipps	250
Schoenoxiphium sparteum (Wahlenb.) C.B.Cl. var. *schimperianum* (Boeck.) Kükenth.	R. Goodier & J. B. Phipps	361
Carex spicato-paniculata C.B.Cl.	J. B. Phipps	288
Carex sp.	R. Goodier	173

21. Palmae

Phoenix reclinata Jacq.	J. B. Phipps	(seen only)

26. Restionaceae

Restio sp. ♂	R. Goodier & J. B. Phipps	35
Restio sp. ♀	R. Goodier & J. B. Phipps	35
Restionaceae sp. ♂	R. Goodier & J. B. Phipps	1
Restionaceae sp. ♀	J. B. Phipps	2168

		Collector	Coll. No.
29.	**Xyridaceae**		
	Xyris brunnea Nilss.	R. Goodier	185
	Xyris gerrardii N.E. Br.	Miss Weiste . . . SRGH	9125
	Xyris hildebrandtii Nilss.	H. Wild	2908
	Xyris natalensis Nilss.	F. W. J. McCosh	16
	Xyris rehmannii Nilss.	J. B. Phipps	440
	Xyris sp.	R. Goodier & J. B. Phipps	194
30.	**Eriocaulaceae**		
	Eriocaulon africanum Hochst.	H. Wild	3579
	Eriocaulon sp. nr. *E. hanningtonii* N.E. Br.	H. Wild	3566
	Eriocaulon sp.	A. R. A. Noel	2196
	Syngonanthus wahlbergii (Wikstr. ex Körn.) Ruhl.	A. R. A. Noel	2141
	Mesanthemum africanum Moldenke	F. W. J. McCosh	2
33.	**Commelinaceae**		
	Commelina africana L.	R. Goodier & J. B. Phipps	285
	Commelina buchananii C.B.Cl.	J. B. Phipps	484
	Commelina krebsiana Kunth	A. V. Hall	362
	Aneilema aequinoctiale (Beauv.) Kunth	J. B. Phipps	499
	Murdannia simplex (Vahl) Brenan	R. Goodier	140
	Cyanotis foecunda Hassk.	J. B. Phipps	314
36.	**Juncaceae**		
	Juncus dregeanus Kunth	R. Goodier & J. B. Phipps	357
38.	**Liliaceae**		
	Gloriosa superba L.	J. B. Phipps	462
	Wurmbea tenuis Bak.	A. V. Hall	425
	Bulbine latifolia Roem. & Schult.	H. Wild	3611
	Anthericum filiforme Thunb. var. *reflexipilosum* Kuntze	R. Goodier	509
	Anthericum rhodesianum Rendle	R. Goodier	510
	Eriospermum abyssinicum Bak.	H. C. Taylor	1795
	Eriospermum sp. nr. *E. abyssinicum* Bak.	J. B. Phipps	840
	Dianella ensifolia (L.) Red.	Miss Weiste	9142
	Kniphofia sp. ? *K. zombensis* Bak.	A. V. Hall	423
	Aloe chabaudii Schönl.	L. C. Leach	9043
	Aloe munchii Christian	G. W. Reynolds	8225
	Aloe hazeliana Reynolds	R. Goodier	1002
	Aloe melsetterensis Christian	L. C. Leach . . . (seen only)	
	Aloe swynnertonii Rendle	L. C. Leach	9028
	Aloe torrei Verdoorn & Christian var. *wildii* Reynolds	H. Wild	3541
	Aloe howmanii Reynolds	R. C. Munch	4
	Urginea nyasae Rendle	K. E. Sturgeon . . SRGH	30517
	Albuca sp. nr. *A. kirkii* (Bak.) Brenan	R. C. Munch	272
	Drimia zombensis Bak.	N. C. Chase	2947
	Scilla sp. aff. *S. natalensis* Planch.	N. C. Chase	2917
	Scilla sp. no. 1	R. Goodier & J. B. Phipps	339
	Scilla sp. no. 2	H. Wild	3535
	Eucomis undulata Ait.	A. V. Hall	234
	Asparagus asparagoides (L.) Wight	J. B. Phipps	397
	Asparagus plumosus Bak.	J. B. Phipps	466
	Asparagus virgatus Bak.	J. B. Phipps	464
	Behnia reticulata Didr.	C. F. M. Swynnerton	1098

		Collector	Coll. No.
38a.	**Smilacaceae**		
	Smilax kraussiana Meisn.	C. F. M. Swynnerton	1099
40.	**Amaryllidaceae**		
	Anoiganthus luteus Bak.	H. Wild	4580
	Cyrtanthus rhodesianus Rendle	C. F. M. Swynnerton	769
40a.	**Hypoxidaceae**		
	Hypoxis angustifolia Lam.	R. Goodier	219
	Hypoxis argentea Harv.	A. R. A. Noel	2183
	Hypoxis sp. aff. *H. dregei* (Bak.) Nel	H. Wild	3578
	Hypoxis nyasica Bak.	H. Wild	2967
	Hypoxis rigidula Bak.	R. Goodier & J. B. Phipps	205
	Hypoxis sp. = F. R. Williams 192	R. Goodier & J. B. Phipps	338
41.	**Velloziaceae**		
	Vellozia sp.	H. Wild	3612
44.	**Iridaceae**		
	Moraea setacea (Thunb.) Ker	H. Wild	3550
	Moraea sp.	D. Garley	177
	Dietes prolongata (Bak.) N.E. Br.	R. C. Munch	438
	Aristea cognata N.E. Br.	J. B. Phipps	677
	Aristea ecklonii Bak.	J. B. Phipps	(seen only)
	Aristea woodii N.E. Br.	J. B. Phipps	346
	Dierama pendulum Bak.	Miss Weiste SRGH	9100
	Crocosmia aurea (Pappe ex Hook.) Planch.	A. V. Hall	424
	Gladiolus crassifolius Bak.	R. C. Munch	212
	Gladiolus psittacinus Hook.	J. B. Phipps	431
	Gladiolus sp.	S. Thompson	37
	Lapeyrousia sp. nr. *L. welwitschii* Bak.	R. Goodier	183
	Radinosiphon leptostachya (Bak.) N.E. Br.	J. B. Phipps	298
45.	**Musaceae**		
	Strelitzia sp. aff. *S. nicolai* Regel & Körn	R. C. Munch	127
46.	**Zingiberaceae**		
	Aframomum angustifolium (Sonn.) K. Schum.	A. V. Hall	252
50.	**Orchidaceae**		
	Stenoglottis fimbriata Lindl.	A. V. Hall	297
	Holothrix macowaniana Reichb. f.	J. S. Ball	579
	Holothrix orthoceras Reichb. f.	J. S. Ball	286
	Holothrix villosa Lindl.	J. S. Ball	583
	Cynorchis anisoloba Summerh.	J. S. Ball	244
	Cynorchis kassneriana Kraenzl.	J. S. Ball	243
	Cynorchis kirkii Rolfe	J. S. Ball	424
	Habenaria sp. ? *H. anaphysema* Reichb. f.	J. B. Phipps	369
	Habenaria sp. cf. *H. chirensis* Reichb. f.	J. S. Ball	237
	Habenaria macrostele Summerh.	R. Goodier	198
	Habenaria sp. No. 1 (§ *Bilabrellae*)	J. B. Phipps	339
	Habenaria sp. No. 2 (§ *Bilabrellae*)	J. S. Ball	236
	Habenaria sp. No. 3 (§ *Ceratopetalae*)	J. S. Ball	238

	Collector	Coll. No.
Habenaria sp. No. 4 (§ *Ceratopetalae*)	J. S. Ball	215
Brachycorythis buchananii (Schlechter) Rolfe	J. B. Phipps	429
Brachycorythis inhambanensis Schlechter	J. S. Ball	190
Brachycorythis ovata Lindl. subsp. *welwitschii* (Reichb. f.) Summerh.	J. S. Ball	422
Brachycorythis pleistophylla Reichb. f.	J. S. Ball	423
Brachycorythis tenuior Reichb. f.	J. S. Ball	218
Neobolusia ciliata Summerh.	A. V. Hall	225
Satyrium atherstonei Reichb. f.	J. B. Phipps	413
Satyrium breve Rolfe	J. S. Ball	415
Satyrium longicauda Lindl.	J. B. Phipps	441
Satyrium sp. ? *S. mechowianum* Kraenzl.	J. S. Ball	187
Satyrium neglectum Schlechter	J. B. Phipps	375
Satyrium sp. ? *S. retusum* Lindl. (= SRGH 30557)	J. S. Ball	546
Satyrium sp. no. 1 (§ *Eusatyrium*)	H. Wild	3600
Satyrium sp. no. 2	J. S. Ball	571
Satyrium sp. no. 3 (aff. J. S. Ball 571)	J. S. Ball	285
Satyrium sp. no. 4	J. S. Ball	578
Schizochilus sp. ? *S. caffrus* Schlechter	J. B. Phipps	680
Schizochilus sp. ? *S. cecilii* Rolfe	J. S. Ball	548
Schizochilus sp.	J. S. Ball	358
Brownleea parviflora Harv.	J. S. Ball	283
Brownleea sp. = SRGH 23662	J. S. Ball	SRGH 50961
Disa concinna N.E. Br.	J. S. Ball	426
Disa equestris Reichb. f.	J. S. Ball	450
Disa hircicornis Reichb. f.	J. B. Phipps	430
Disa leucostachys Kraenzl.	J. B. Phipps	645
Disa leucostachys Kraenzl. var.	J. B. Phipps	681
Disa ornithantha Schlechter	R. Goodier	195
Disa patula Sond. var. *transvaalensis* Summerh.	J. B. Phipps	391
Disa rungweensis Schlechter	J. S. Ball	549
Disa saxicola Schlechter	R. Goodier	174
Disa versicolor Reichb. f.	J. B. Phipps	391a
Herschelia sp. no. 1	H. Wild	3556
Herschelia sp. no. 2	J. S. Ball	577
Monadenia sp. ? *M. brevicornis* Lindl.	J. S. Ball	550
Disperis sp. = SRGH 73839	A. V. Hall	409
Vanilla sp.	J. S. Ball	844
Platylepis sp.	J. S. Ball	741
Liparis neglecta Schlechter	A. V. Hall	226
Liparis sp.	A. V. Hall	410
Polystachya albescens Ridl. subsp. *imbricata* (Rolfe) Summerh.	J. S. Ball	181
Polystachya fusiformis Lindl.	J. S. Ball	607
Polystachya gerrardii Harv.	J. S. Ball	(seen only)
Polystachya hollandii Bolus	J. S. Ball	289
Polystachya tayloriana Rendle	J. S. Ball	582
Polystachya transvaalensis Schlechter	J. S. Ball	(seen only)
Polystachya sp. = SRGH 30554	J. S. Ball	246
Ansellia nilotica N.E. Br.	J. S. Ball	(seen only)
Eulophia sp. ? *E. foliosa* (Lindl.) Bolus	J. S. Ball	432
Eulophia milnei Reichb. f.	J. S. Ball	555
Eulophia natalensis Reichb. f.	A. V. Hall	215
Eulophia stolzii Schlechter	J. S. Ball	461
Eulophia tuberculata Bolus	D. L. Garley	168
Eulophia sp. no. 1	J. S. Ball	189
Eulophia sp. no. 2	J. S. Ball	425
Pteroglossaspis eustachya Reichb. f.	R. Goodier & J. B. Phipps	343
Bulbophyllum oreonastes Reichb. f.	J. S. Ball	229

	Collector	Coll. No.
Bulbophyllum oxypterum (Lindl.) Reichb. f.	J. S. Ball	151
Bulbophyllum sandersoni Reichb. f.	A. V. Hall	221
Bulbophyllum sp. ? *B. scaberulum* (Rolfe) Bolus	J. S. Ball	351
Bulbophyllum sp. no. 1(=SRGH 18376)	J. S. Ball	226
Bulbophyllum sp. no. 2	J. S. Ball	344
Bulbophyllum sp. no. 3	J. S. Ball	276
Aerangis mystacidii (Reichb. f.) Schlechter	J. S. Ball	(seen only)
Angraecopsis parviflora (Thomas) Schlechter	J. S. Ball	220
Angraecum chamaenthus Schlechter	J. S. Ball	281
Angraecum conchiferum Lindl.	J. S. Ball	356
Angraecum sp. nr. *A. mauritianum* (Poir.) Frapp.	J. S. Ball	412
Angraecum minus Summerh.	J. S. Ball	282
Angraecum sacciferum Lindl.	J. S. Ball	353
Bolusiella sp.	J. S. Ball	354
Cyrtorchis praetermissa Summerh.	J. S. Ball	(seen only)
Jumelea filicornoides (De Wild.) Schlechter	J. S. Ball	278
Rangaeris muscicola (Reichb. f.) Summerh.	J. S. Ball	223
Rhipidoglossum rutilum (Reichb. f.) Schlechter	W. D. Holmes	0139
Solenangis augustifolia Summerh.	W. D. Holmes	0152
Tridactyle bicaudata (Lindl.) Schlechter	J. S. Ball	277
Tridactyle inaequilonga (De Wild.) Schlechter	J. S. Ball	297
Tridactyle tricuspis (Bolus) Schlechter	J. S. Ball	193
Tridactyle sp. ? *T. tridactylites* (Rolfe) Schlechter	J. S. Ball	191
Ypsilopus longifolius (Kraenzl.) Summerh.	J. S. Ball	245

DICOTYLEDONES

53. Piperaceae

Piper capense L.f.	J. B. Phipps	(seen only)
Peperomia reflexa (L.f.) A. Dietr.	R. C. Munch	308

57. Myricaceae

Myrica sp. aff. *M. brevifolia* E. Mey. ex DC.	H. Wild	3594
Myrica pilulifera Rendle	H. Wild	2862

64. Moraceae

Myrianthus holstii Engl.	R. H. Finlay	SRGH 12662

66. Proteaceae

Faurea forficuliflora Bak.	C. F. M. Swynnerton	? 639
Faurea saligna Harv.	C. F. M. Swynnerton	? 1796
Protea crinita Beard	H. Wild	3639
Protea enervis Wild	N. C. Chase	6902
Protea fulviflora Beard	H. Wild	2890
Protea gazensis Beard	R. Goodier & J. B. Phipps	8a
Protea petiolaris Welw. ex Engl.	R. Goodier & J. B. Phipps	56
Protea welwitschii Engl.	H. Wild	2947
Leucospermum saxosum S. Moore	C. F. M. Swynnerton	652

		Collector	Coll. No.
67.	**Loranthaceae**		
	Loranthus sp.	R. Goodier & J. B. Phipps	179
69.	**Santalaceae**		
	Thesium gracile A. W. Hill or *T. rogersii* A. W. Hill	R. Goodier & J. B. Phipps	124
	Thesium kilimandscharicum Engl.	J. B. Phipps	340
	Thesium nigricans Rendle	R. Goodier	159
	Thesium resedoides A. W. Hill	R. C. Munch	302
	Thesium sp. no. 1	H. Wild	2883
	Thesium sp. no. 2	H. Wild	2868
	Thesium sp. no. 3	R. C. Munch	71
	Thesium sp. no. 4 (= H. Wild 2857)	J. B. Phipps	705
77.	**Polygonaceae**		
	Polygonum strigosum R. Br.	J. B. Phipps	343
79.	**Amarantaceae**		
	Celosia trigyna L.	J. B. Phipps	474a
	Centemopsis gracilenta (Hiern) Schinz	H. Wild	3581
	Cyathula cylindrica Moq.	R. Goodier	995
83a.	**Molluginaceae**		
	Psammotropha myriantha Sond.	J. B. Phipps	406
87.	**Caryophyllaceae**		
	Corrigiola drymariodes Bak. f.	C. F. M. Swynnerton	2159
	Polycarpaea corymbosa (L.) Lam.	C. F. M. Swynnerton	1804
	Silene burchellii Otth ex DC. var. *angustifolia* Sond.	R. Goodier & J. B. Phipps	485
	Dianthus chimanimaniensis Hooper	J. B. Phipps	838
91.	**Ranunculaceae**		
	Knowltonia transvaalensis Szyszyl.	C. F. M. Swynnerton	788
	Clematopsis scabiosifolia (DC.) Hutch.	J. B. Phipps	433
	Ranunculus multifidus Forsk.	J. B. Phipps	425
98.	**Annonaceae**		
	Artabotrys monteiroae Oliv.	C. F. M. Swynnerton	1764
101.	**Monimiaceae**		
	Xymalos monospora Baill.	C. F. M. Swynnerton	1112
102.	**Lauraceae**		
	Cassytha filiformis L.	H. Wild	2879
105.	**Cruciferae**		
	Coronopus integrifolius (DC.) Spreng.	R. Goodier & J. B. Phipps	300
107.	**Melianthaceae**		
	Bersama acutidens Welw. ex Hiern	J. B. Phipps	(seen only)
112.	**Droseraceae**		
	Drosera burkeana Planch.	J. B. Phipps	333
	Drosera dielsiana Exell & Laundon	R. Goodier & J. B. Phipps	232

		Collector	Coll. No.
115.	**Crassulaceae**		
	Crassula alba Forsk.	F. W. J. McCosh	7
	Crassula sp. nr. *C. alba* Forsk.	R. Goodier	177
	Crassula argyrophylla Diels ex Schönl. & Bak. f.	L. C. Leach	7005
	Crassula lineolata Dryand.	R. Goodier	210
	Crassula nodulosa Schönl.	A. V. Hall	244
	Crassula schimperi Fisch. & Mey.	R. C. Munch	204
	Kalanchoë lanceolata Pers.	J. B. Phipps	(seen only)
	Kalanchoë sp.	L. C. Leach	9046
117.	**Saxifragaceae**		
	Choristylis rhamnoides Harv.	R. Goodier & J. B. Phipps	172
121.	**Myrothamnaceae**		
	Myrothamnus flabellifolia Welw.	R. H. Finlay	SRGH 12657
126.	**Rosaceae**		
	Rubus pinnatus Willd.	R. Goodier & J. B. Phipps	358
	Rubus rigidus Smith	H. Wild	2961
	Alchemilla cryptantha Steud. ex A. Rich.	R. Goodier & J. B. Phipps	279
	Cliffortia nitidula (Engl.) Rob. E. & Th. Fr. f.	R. C. Munch	207
	Parinari curatellifolia Planch. ex Benth. subsp. *mobola* (Oliv.) R. Grah.	R. Goodier & J. B. Phipps	(seen only)
128.	**Leguminosae**		
	Cassia kirkii Oliv.	A. V. Hall	263
	Cassia mimosoides L.	H. C. Taylor	1814
	Brachystegia spiciformis Benth.	R. Goodier & J. B. Phipps	314
	Brachystegia tamarindoides Welw.	R. Goodier & J. B. Phipps	(seen only)
	Erythrophleum guineense Don	G. M. McGregor	46/48
	Newtonia buchananii (Bak.) Gilb. & Bout.	R. H. Finlay	SRGH 12659
	Calpurnia subdecandra (L'Hérit.) Schweick.	R. Goodier & J. B. Phipps	150
	Pearsonia aristata Dümm.	R. C. Munch	SRGH 21015
	Pearsonia aristata Dümm. var. *gazensis* Bak.	C. F. M. Swynnerton	1418
	Pearsonia sp.	N. C. Chase	1417
	Pleiospora latebracteolata Dümm.	R. Goodier	481
	Crotalaria caudata Welw. ex Bak.	J. B. Phipps	480
	Crotalaria laburnifolia L.	H. Wild	2931
	Crotalaria sp. no. 1	H. Wild	2866
	Crotalaria sp. no. 2	J. B. Phipps	329
	Argyrolobium rhodesianum Bak. f.	R. Goodier & J. B. Phipps	334
	Argyrolobium shirense Taub.	J. B. Phipps	701
	Lotus discolor E. Mey. subsp. *discolor*	A. R. A. Noel	2070
	Lotus wildii Gillett	H. Wild	2975
	Psoralea foliosa Oliv.	R. C. Munch	125
	Indigofera cecilii N.E. Br.	H. Wild	4568
	Indigofera lyallii Bak.	C. F. M. Swynnerton	1458
	Indigofera oxalidea Welw. ex. Bak.	J. B. Phipps	255
	Tephrosia aequilata Bak.	H. Wild	4589
	Tephrosia longipes Meisn.	A. R. A. Noel	2158
	Tephrosia shiluwanensis Schinz	J. B. Phipps	454
	Craibia brevicaudata (Vatke) Dunn	N. C. Chase	2957
	Aeschynomene aphylla Wild	H. Wild	2073
	Aeschynomene gazensis Bak. f.	R. C. Munch	121

	Collector	Coll. No.
Aeschynomene grandistipulata Harms.	C. F. M. Swynnerton	1499
Aeschynomene inyangensis Wild	H. Wild	4567
Aeschynomene nodulosa Bak. f.	H. Wild	2925
Desmodium hirtum G. & P.	A. V. Hall	447
Smithia thymodora Bak. f.	H. Wild	2895
Pseudarthria hookeri Wight & Arn.	J. B. Phipps	435
Dalbergia nitidula Welw. ex Bak.	L. M. Hodgson	43/57
Vigna galpinii Burtt Davy	R. Goodier	480
Vigna gazensis Bak. f.	R. C. Munch	91
Vigna sp. ? *V. vexillata* Benth.	S. Thompson	34
Sphenostylis sp.	J. B. Phipps	456
Dumasia villosa DC.	A. V. Hall	366
Glycine javanica L.	A. V. Hall	483
Rhynchosia clivorum S. Moore	C. F. M. Swynnerton	1461
Rhynchosia monophylla Schlechter	R. Goodier	639
Rhynchosia sp. no. 1	H. Wild	2892
Rhynchosia sp. no. 2	R. C. Munch	85
Eriosema sp. nr. *E. cyclophyllum* Welw. ex Bak.	J. B. Phipps	304
Eriosema montanum Bak. f.	R. Goodier & J. B. Phipps	356
Eriosema shirense Bak. f.	R. Goodier & J. B. Phipps	141

129. Geraniaceae

Geranium nyassense Knuth	J. B. Phipps	371
Geranium ocellatum Cambess.	R. Goodier	994
Pelargonium graveolens L'Hérit.	S. Thompson	8
Pelargonium luridum (Andr.) Sweet	R. Goodier	217

130. Oxalidaceae

Oxalis semiloba Sond.	J. B. Phipps	302

134. Erythroxylaceae

Erythroxylum emarginatum Thonn.	C. F. M. Swynnerton	1364 or 1365

137. Rutaceae

Toddalia asiatica (L.) Lam.	R. Goodier & J. B. Phipps	159
Teclea welwitschii (Hiern) Verdoorn	C. F. M. Swynnerton	1322

140. Meliaceae

Ekebergia benguellensis Welw. ex C.DC.	R. Goodier & J. B. Phipps	319
Ekebergia rueppelliana (Fresen.) A. Rich.	R. C. Munch	347

145. Polygalaceae

Polygala hottentotta C. Presl	R. Goodier	499
Polygala ohlendorfiana Eckl. & Zeyh.	R. Goodier	488
Polygala producta N.E. Br.	H. C. Taylor	1743
Polygala sphenoptera Fresen.	J. B. Phipps	286a
Polygala spicata Chod.	J. B. Phipps	239
Polygala teretifolia L.f.	R. Goodier & J. B. Phipps	36
Polygala uncinata E. Mey. ex Meisn.	W. P. Johnson	212
Polygala virgata Thunb. var. *decora* (Sond.) Harv.	C. F. M. Swynnerton	2042
Polygala wilmsii Chod.	Miss Weiste SRGH	9153
Muraltia flanaganii Bolus	R. H. Finlay SRGH	12652

		Collector	Coll. No.
147.	**Euphorbiaceae**		
	Phyllanthus graminicola Hutch.	H. Wild	2959
	Phyllanthus hutchinsonianus S. Moore	C. F. M. Swynnerton	1524
	Phyllanthus nummulariifolius Poir.	J. B. Phipps	463
	Phyllanthus sp.	H. Wild	2894
	Uapaca kirkiana Muell. Arg.	A. V. Hall	516
	Uapaca sp.	H. Wild	3523
	Bridelia micrantha (Hochst.) Baill.	R. Goodier	149
	Macaranga capensis (Baill.) Sim	J. B. Phipps	s.n.
	Macaranga mellifera Prain	R. Goodier & J. B. Phipps	152
	Acalypha punctata Meisn.	R. Goodier & J. B. Phipps	292
	Clutia mollis Pax	H. Wild	2976
	Clutia monticola S. Moore	H. Wild	2965
	Clutia paxii Knauf	A. R. A. Noel	2063
	Clutia swynnertonii S. Moore	A. V. Hall	299
	Clutia sp. no. 1	H. Wild	4582
	Clutia sp. no. 2	H. Wild	2970
	Clutia sp. no. 3	R. Goodier	180
	Suregada procera (Prain) Croizat	C. F. M. Swynnerton	1115
	Euphorbia cyparissiodes Pax	R. Goodier & J. B. Phipps	324
	Euphorbia depauperata Hochst. ex A. Rich.	R. C. Munch	111
	Euphorbia ericoides Lam.	H. Wild	3596
	Euphorbia griseola Pax	J. B. Phipps	841
	Euphorbia sp = N.C. Chase 525	R. Watmough	50
153.	**Anacardiaceae**		
	Rhus legati Schönl.	J. B. Phipps	491
	Rhus lucida L.	C. F. M. Swynnerton	635
	Rhus natalensis Bernh.	H. Wild	3637
	Rhus sp. = H. Wild 1460	K. E. Sturgeon	SRGH 30616
157.	**Aquifoliaceae**		
	Ilex mitis (L.) Radlk.	R. Goodier	144
158.	**Celastraceae**		
	Maytenus acuminata (L.f.) Loes.	J. B. Phipps	280
	Maytenus cymosa (Soland.) Exell	R. Goodier & J. B. Phipps	155
	Pterocelastrus tricuspidatus (Lam.) Sond.	H. Wild	4581
162.	**Icacinaceae**		
	Cassinopsis tinifolia Harv.	H. Wild	4585
	Apodytes dimidiata E. Mey.	A. V. Hall	283
165.	**Sapindaceae**		
	Zanha golungensis Hiern	R. Goodier & J. B. Phipps	156
	Allophylus buchananii Gilg ex Radlk.	A. R. A. Noel	2047
	Dodonaea viscosa (L.) Jacq.	A. R. A. Noel	1980
168.	**Balsaminaceae**		
	Impatiens cecilii N.E. Br.	J. B. Phipps	419
	Impatiens sp. ? *I. trichochila* Warb.	J. B. Phipps	(seen only)
	Impatiens sp. no. 1	H. Wild	2952
	Impatiens sp. no. 2	R. Goodier	1000
169.	**Rhamnaceae**		
	Rhamnus prinioides L'Hérit.	A. V. Hall	294
	Phylica ericoides L.	H. Wild	3603
	Phylica paniculata Willd.	C. F. M. Swynnerton	632a

		Collector	Coll. No.
170.	**Vitaceae**		
	Cissus buchananii Planch.	A. V. Hall	314
	Rhoicissus erythrodes Fresen.	A. V. Hall	289
	Rhoicissus rhomboidea Planch.	C. F. M. Swynnerton	1381
174.	**Tiliaceae**		
	Sparrmannia ricinocarpa (Eckl. & Zeyh.) Kuntze	R. Goodier	138
	Triumfetta pilosa Roth var. *effusa* (E. Mey. ex Harv.) Wild	J. B. Phipps	399
175.	**Malvaceae**		
	Pavonia columella Cav.	R. C. Munch	95
	Hibiscus burtt-davyi Dunkley	R. C. Munch	103
	Hibiscus surattensis L.	R. Goodier	1005
178.	**Sterculiaceae**		
	Dombeya burgessiae Gerr. ex Harv.	J. B. Phipps	(seen only)
	Waltheria indica L.	C. F. M. Swynnerton	2057
182.	**Ochnaceae**		
	Ochna gracilipes Hiern	H. Wild	3547
	Ochna longipes Bak.	R. Goodier & J. B. Phipps	174
187.	**Guttiferae**		
	Garcinia milanjianus Dunkley	H. Wild	3552
187a.	**Hypericaceae**		
	Harungana madagascariensis Lam. ex Poir.	R. Goodier	135
	Hypericum aethiopicum Thunb. subsp. *sonderi* (Bredell) N. Robson	R. C. Munch	193
	Hypericum lalandii Choisy	J. B. Phipps	273
	Hypericum roeperanum Schimper ex A. Rich.	R. Goodier & J. B. Phipps	349
199.	**Flacourtiaceae**		
	Rawsonia lucida Harv. & Sond.	R. Goodier & J. B. Phipps	170
	Kiggelaria africana L.	C. F. M. Swynnerton	2039
	Gerrardina eylesiana Milne-Redh.	H. C. Taylor	1752
	Aphloia theiformis (Vahl) Benn.	C. F. M. Swynnerton	634
	Dovyalis lucida Sim	H. Wild	3634
203.	**Passifloraceae**		
	Tryphostemma sp.	R. Goodier & J. B. Phipps	360
208.	**Begoniaceae**		
	Begonia natalensis Hook.	J. B. Phipps	286
210.	**Cactaceae**		
	Rhipsalis cassutha Gaertn.	J. B. Phipps	235
213.	**Oliniaceae**		
	Olinia sp.	H. Wild	3606

		Collector	Coll. No.
214.	**Thymelaeaceae**		
	Peddiea africana Harv.	R. Goodier & J. B. Phipps	168
	Gnida fastigiata Rendle	H. Wild	3632
	Gnidia kraussiana Meisn.	J. B. Phipps	424
	Gnidia phyllodinea S. Moore	R. C. Munch	183
	Struthiola rhodesiana B. Peters.	R. C. Munch	296
	Struthiola sp.	R. C. Munch	75
	Passerina sp.	R. Goodier & J. B. Phipps	270
	Dais cotinifolia L.	R. Goodier & J. B. Phipps	158
220.	**Rhizophoraceae**		
	Cassipourea gerrardii (Schinz) Alston	R. Goodier & J. B. Phipps	153
222.	**Myrtaceae**		
	Eugenia angolensis Engl.	R. Goodier & J. B. Phipps	10
	Eugenia nyassensis Engl.	R. Goodier & J. B. Phipps	177
	Eugenia sp.	H. Wild	2884
	Syzygium cordatum Hochst. ex Krauss	R. Goodier & J. B. Phipps	266
	Syzygium gerrardii (Harv.) Hochst.	R. Goodier & J. B. Phipps	304
	Syzygium masukuense (Bak.) R.E. Fr.	J.B. Phipps	488
	Syzygium sclerophyllum Brenan	A. V. Hall	330
223.	**Melastomataceae**		
	Antherotoma naudinii Hook. f.	J. B. Phipps	689
	Pseudosbeckia swynnertonii (Bak. f.) A. & R. Fernandes	C. F. M. Swynnerton	2085
	Dissotis angolensis Cogn.	J. B. Phipps	341
	Dissotis canescens (E. Mey. ex Grah.) Hook. f.	R. Goodier	215
	Dissotis princeps (Bonpl.) Triana	R. Goodier & J. B. Phipps	51
	Dissotis pulchra A. & R. Fernandes	D. C. Plowes	1216
224.	**Onagraceae**		
	Epilobium flavescens E. Mey. ex Harv.	J. B. Phipps	376a
225.	**Halorrhagidaceae**		
	Laurembergia repens Berg.	R. Goodier & J. B. Phipps	23
227.	**Araliaceae**		
	Cussonia spicata Thunb.	C. F. M. Swynnerton	2092
	Cussonia umbellifera Sond.	C. F. M. Swynnerton	653a
228.	**Umbelliferae**		
	Hydrocotyle sibthorpioides Lam.	A. R. A. Noel	2161
	Centella sp.	H. Wild	2893
	Alepidea amatymbica Eckl. & Zeyh.	R. Goodier & J. B. Phipps	332
	Alepidea gracilis Dümm.	J. B. Phipps	434
	Alepidea gracilis Dümm. var. *major* Weim.	J. B. Phipps	673
	Alepidea longifolia E. Mey. subsp. *propinqua* (Dümm) Weim.	R. C. Munch	194
	Heteromorpha trifoliata (Wendl.) Eckl. & Zeyh.	A. R. A. Noel	2185
	Pimpinella sp.	R. Goodier & J. B. Phipps	362
	Diplolophium swynnertonii (Bak. f.) Norman	F. W. J. McCosh	3
	Peucedanum sp. = H. Wild 4645	J. B. Phipps	428

		Collector	Coll. No.
229.	**Cornaceae**		
	Curtisia faginea Ait.	C. F. M. Swynnerton	637
233.	**Ericaceae**		
	Erica eylesii Bolus	R. C. Munch	106
	Erica gazensis Wild	H. Wild	4588
	Erica johnstoniana Britten	Miss Weiste . . . SRGH	9146
	Erica lanceolifera S. Moore	C. F. M. Swynnerton	1288
	Erica pleiotricha S. Moore	H. Wild	4583
	Erica swynnertonii S. Moore	C. F. M. Swynnerton	? 1063–5
	Philippia hexandra S. Moore	H. Wild	2856
	Philippia manii (Hook. f.) Alm. & Th. Fr. f.	R. C. Munch	202
	Philippia simii S. Moore	R. Goodier	165
	Blaeria friesii Weim.	R. Goodier	211
236.	**Myrsinaceae**		
	Myrsine africana L.	C. F. M. Swynnerton	? 633
	Maesa lanceolata Forsk.	H. Wild	2877
	Rapanea melanophloeos (L.) Mez	R. Goodier & J. B. Phipps	210
239.	**Sapotaceae**		
	Pouteria magalismontana (Sond.) A. Meeuse	J. B. Phipps	s.n.
240.	**Ebenaceae**		
	Royena lucida L.	R. Goodier & J. B. Phipps	165
	Euclea lanceolata E. Mey.	R. Goodier & J. B. Phipps	171
243.	**Oleaceae**		
	Olea africana Mill.	H. Wild	4575
	Jasminum meyeri-johannis Engl.	R. Goodier & J. B. Phipps	302
245a.	**Buddlejaceae**		
	Buddleja salviifolia (L.) Lam.	R. Goodier & J. B. Phipps	(seen only)
245b.	**Strychnaceae**		
	Strychnos spinosa Lam. subsp. *lokua* (A. Rich.) E. A. Bruce	R. Goodier & J. B. Phipps	303
246.	**Gentianaceae**		
	Sebaea grandiflora Schinz	R. C. Munch	293
	Sebaea leiostyla Gilg	R. C. Munch	112
	Sebaea sp.	R. C. Munch	184
	Exochaenium grande Griseb.	R. Goodier	154
	Chironia gratissima S. Moore	H. C. Taylor	1749
	Chironia laxiflora Bak.	Miss Weiste . . . SRGH	9145
	Swertia sharpei N.E. Br.	R. Goodier & J. B. Phipps	48
	Swertia stellarioides Fic.	A. V. Hall	428
246a.	**Menyanthaceae**		
	Nymphoides sp.	R. Goodier & J. B. Phipps	288
247.	**Apocynaceae**		
	Landolphia sp.	R. H. Finlay . . . SRGH	12783
	Conopharyngia stapfiana (Britten) Stapf	R. Goodier & J. B. Phipps	347
	Mascarenhasia variegata (Britten & Rendle) N.E. Br.	N. C. Chase	2993

		Collector	Coll. No.
248.	**Asclepiadaceae**		
	Ectadiopsis oblongifolia (Meisn.) Schlechter	J. B. Phipps	492
	? *Raphionacme* sp.	J. B. Phipps	839
	Schizoglossum leptoglossum Weim.	J. B. Phipps	500
	Gomphocarpus aureus Schlechter	R. Goodier & J. B. Phipps	242
	Gomphocarpus nyikana (Schlechter) Bullock	R. Goodier & J. B. Phipps	137
	Trachycalymma cristatum (Decne.) Bullock	H. Wild	3610
	(? = *Asclepias scabrifolia* N.E. Br.	C. F. M. Swynnerton ? 1915)	
	Trachycalymma cucullatum (Schlechter) Bullock	R. Goodier & J. B. Phipps	200
	Trachycalymma fimbriatum (Weim.) Bullock	R. Goodier & J. B. Phipps	198
	? *Trachycalymma* sp.	R. Goodier & J. B. Phipps	199
	Sisyranthus rhodesicus Weim.	R. Goodier & J. B. Phipps	325
253.	**Verbenaceae**		
	Lantana trifolia L.	J. B. Phipps	377
	Clerodendrum myricoides (Hochst.) R. Br. var. *camporum* Gürke	A. V. Hall	297
	Clerodendrum sp.	C. F. M. Swynnerton	? 2004
254.	**Labiatae**		
	Leonotis leonitis R. Br.	A. R. A. Noel	2082
	Leonotis mollissima Gürke	A. R. A. Noel	2040
	Leonotis spectabilis S. Moore	C. F. M. Swynnerton	2013
	Stachys aethiopica L.	H. Wild	3624
	Stachys sp. aff. *S. aethiopica* L.	J. B. Phipps	285
	Satureja biflora (Buch.-Ham. ex D. Don) Briq.	A. V. Hall	431a
	Aeolanthus canescens Gürke	J. B. Phipps	436
	Aeolanthus nyassae Gürke	A. V. Hall	293
	Plectranthus caudatus S. Moore	C. F. M. Swynnerton	2010
	Plectranthus chimanimanensis S. Moore	C. F. M. Swynnerton	2019
	Plectranthus grandidentatus Gürke	J. B. Phipps	498
	Plectranthus laxiflorus Benth.	A. R. A. Noel	2074
	Plectranthus swynnertonii S. Moore	J. B. Phipps	461
	Plectranthus sp. = H. Wild 4505	H. Wild	2195
	Plectranthus sp. = R. Goodier 194	R. Goodier & J. B. Phipps	42
	Coleus latifolius Hochst. ex Benth.	H. Wild	2880
	Coleus thyrsoideus Bak.	H. Wild	2950
	Coleus gazensis S. Moore	Miss Weiste SRGH	9102
	Iboza riparia (Hochst.) N.E. Br.	F. W. J. McCosh	14
	Acrocephalus chirindensis S. Moore	J. B. Phipps	337
	Geniosporum angolense Briq.	J. B. Phipps	421
	Hemizygia flabellifolia S. Moore	C. F. M. Swynnerton	1414
	Hemizygia welwitschii (Rolfe) Ashby	H. Wild	3553
	Hemizygia sp.	H. C. Taylor	1816
256.	**Solanaceae**		
	Nicandra physalodes (L.) Gaertn.	A. V. Hall	443
	Solanum indicum L.	R. Goodier & J. B. Phipps	161
	Physalis peruviana L.	R. Goodier & J. B. Phipps	320
257.	**Scrophulariaceae**		
	Diclis tenella Hemsl.	R. Goodier	993
	Halleria lucida L.	R. Goodier & J. B. Phipps	173
	Teedia lucida Rudolphi	H. Wild	4579
	Freylinia tropica S. Moore	H. C. Taylor	1769
	Sutera carvalhoi Skan	H. Wild	3628
	Sutera sp. = Crook M39	J. B. Phipps	376

	Collector	Coll. No.
Zaluzianskia maritima (L.f.) Walp.	Miss Weiste . . . SRGH	9148
Craterostigma nanum (Benth.) Oliv.	R. Goodier & J. B. Phipps	43
Alectra sp. *A. picta* Hemsl.	J. B. Phipps	684
Alectra sp.	R. Goodier	156
Gerardiina angolensis Engl.	Miss Weiste . . . SRGH	9106
Graderia scabra Benth.	R. Goodier & J. B. Phipps	282
Sopubia dregeana Benth.	F. W. J. McCosh	10
Sopubia simplex Hochst.	R. Goodier	479
Buchnera henriquesii Engl.	H. C. Taylor	1777
Buchnera lastii Engl.	R. Goodier & J. B. Phipps	128
Buchnera multicaulis Engl.	R. Goodier	512
Buchnera sp. no. 1	H. Wild	2896
Buchnera sp. no. 2	H. Wild	2886
Cycnium adonense E. Mey.	R. C. Munch	196
Striga asiatica (L.) Kuntze	Miss Weiste . . . SRGH	9134
Striga bilabiata (Thunb.) Kuntze	J. B. Phipps	342
Striga elegans Benth.	Miss Weiste . . . SRGH	9150

257a. Selaginaceae

Hebenstretia dentata L.	H. Wild	2969
Walafrida goetzei (Rolfe) Brenan var. *brevipila* Brenan	R. Goodier & J. B. Phipps	26
Walafrida goetzei (Rolfe) Brenan var. *goetzei* Brenan	J. B. Phipps	387

257b. Lentibulariaceae

Genlisea hispidula Stapf	J. B. Phipps	403
Utricularia sp. ? *U. welwitschii* Oliv.	F. W. J. McCosh	1
Utricularia sp.	J. B. Phipps	412

262. Gesneriaceae

Streptocarpus eylesii S. Moore	J. B. Phipps	465
Streptocarpus michelmorei B.L. Burtt	R. C. Munch	371
Streptocarpus umtaliensis B. L. Burtt	J. B. Phipps	493
Streptocarpus sp.	H. Wild	2938

266. Acanthaceae

Thunbergia alata Boj. ex Sims	J. B. Phipps	472
Mellera lobulata S. Moore	H. Wild	3576
Phaulopsis imbricata (Forsk.) Sweet	A. R. A. Noel	2175
Brillantaisia subulugurica Burkill	R. H. Finlay . . . SRGH	12664
Pseuderanthemum subviscosum (C.B. Cl.) Stapf	H. Wild	3575
Dicliptera nobilis S. Moore	J. B. Phipps	(seen only)
Hypoestes verticillaris (L.f.) Soland. ex Roem. & Schult.	A. R. A. Noel	2039
Justicia betonicoides C.B. Cl.	J. A. Whellan	1267
Justicia sp.	J. B. Phipps	490

270. Rubiaceae

Oldenlendia angolensis K. Schum.	J. B. Phipps	253
Oldenlandia herbacea (L.) Roxb.	J. B. Phipps	489
Oldenlandia muscosa Brem.	J. A. Whellan	1287
Oldenlandia rupicola (Sond.) Kuntze	C. F. M. Swynnerton	2152
Kohautia amatymbica Eckl. & Zeyh.	R. Goodier & J. B. Phipps	183
Pentas purpurea Oliv.	J. B. Phipps	259
Hymenodyction floribundum (Hochst. & Steud.) B. L. Robinson	R. Goodier & J. B. Phipps	181
Cephalanthus natalensis Oliv.	A. V. Hall	435
Otomeria elatior (A. Rich. ex DC.) Verdcourt	J. B. Phipps	250

	Collector	Coll. No.
Mussaenda arcuata Lam. ex Poir.	J. B. Phipps	(seen only)
? *Tarenna* sp.	R. Goodier & J. B. Phipps	328
Aidia micrantha (K. Schum.) Bullock	R. Goodier	998
Oxyanthus speciosus DC.	R. Goodier & J. B. Phipps	148
Tricalysia myrtifolia S. Moore	H. Wild	3525
Tricalysia pachystigma K. Schum.	C. F. M. Swynnerton	641
Pentanisia schweinfurthii Hiern	J. B. Phipps	254
Pentanisia sykesii Hutch. subsp. *otomerioides* Verdcourt	J. B. Phipps	343a
Vangueria longicalyx Robyns	A. V. Hall	432
Rytigynia sp.	R. Goodier & J. B. Phipps	149
Canthium ventosum (L.) S. Moore	J. B. Phipps	395
Canthium zanzibaricum Klotzsch	R. Goodier & J. B. Phipps	154
Canthium sp. = F. B. Armitage 57/55	R. Goodier & J. B. Phipps	359
Fadogia monticola Robyns	R. Goodier & J. B. Phipps	186
Rutidea syringoides (Webb) Brem.	H. Wild	2930
Pavetta comostyla S. Moore	R. Goodier & J. B. Phipps	144
Psychotria sp.	R. Goodier & J. B. Phipps	331
Grumilea kirkii Hiern	H. Wild	2929
Grumilea sp. ? *G. punicea* S. Moore	R. Goodier	150
Lasianthus kilimandscharicus K. Schum.	A. V. Hall	398
Pachystigma pygmaea (Schlechter) Robyns	R. Goodier	486
Galopina circaeoides (Thunb.) Kunth	A. V. Hall	296
Anthospermum aethiopicum L.	H. Wild	4578
Anthospermum ammannioides S. Moore	A. R. A. Noel	2029
Anthospermum erectum Suesseng.	J. B. Phipps	409
Anthospermum herbaceum L.f.	A. V. Hall	285
Anthospermum vallicola S. Moore	C. F. M. Swynnerton	2155
Anthospermum whyteanum Britten	R. Goodier	142
Otiophora inyangana N.E. Br. forma	R. Goodier	216
Otiophora inyangana N.E. Br. var. *parvifolia* Verdcourt	J. B. Phipps	669
Otiophora scabra Zucc.	J. B. Phipps	495
Diodia natalensis (Hochst.) Garcia	J. B. Phipps	474
Galium bussei K. Schum. var. *glabrum* Brenan	J. B. Phipps	432
Rubia cordifolia L.	A. V. Hall	300

273. Valerianaceae

Valeriana capensis Thunb.	J. B. Phipps	426

274. Dipsacaceae

Scabiosa columbaria L.	J. B. Phipps	380

276. Campanulaceae

Wahlenbergia grandiflora v. Brehm.	A. R. A. Noel	2177
Wahlenbergia mashonica N.E. Br.	H. Wild	2190
Wahlenbergia virgata Engl.	R. Goodier	484
Lightfootia sp.	R. C. Munch	182
Cyphia alba N.E. Br.	R. Goodier	497
Cyphia mazoensis S. Moore	A. V. Hall	390

276a. Lobeliaceae

Lobelia chamaedryfolia (Presl) A. DC.	R. C. Munch	195
Lobelia cobaltica S. Moore	C. F. M. Swynnerton	2036
Lobelia decipiens Sond.	H. C. Taylor	1744
Lobelia filiformis Lam.	J. A. Whellan	1254
Lobelia nuda Hemsl.	R. Goodier	199
Lobelia polyodon E. Wimm.	H. Wild	2902
Lobelia wildii E. Wimm.	H. Wild	3619

		Collector	Coll. No.
280.	**Compositae**		
	Erlangea inyangana (N.E. Br.) B. L. Burtt	A. V. Hall	352
	Erlangea sp.	H. Wild	2865
	Vernonia bainesii Oliv. & Hiern	Miss Weiste . . . SRGH	9125
	Vernonia gerberiiformis Oliv. & Hiern	H. Wild	2964
	Vernonia gracilipes S. Moore	H. Wild	2951
	Vernonia hirsuta Sch. Bip.	R. C. Munch	171
	Vernonia leucocalyx O. Hoffm.	R. C. Munch	126
	Vernonia monocephala Harv.	C. F. M. Swynnerton	?1829
	Vernonia natalensis Sch. Bip.	R. Goodier & J. B. Phipps	7
	Vernonia umbratica Oberm.	J. B. Phipps	467a
	Adenostemma caffrum DC.	J. B. Phipps	427a
	Eupatorium africanum Oliv. & Hiern	R. Goodier & J. B. Phipps	6
	Dichrocephala integrifolia (L.f.) Kuntze	R. Goodier & J. B. Phipps	293
	Aster sp.	J. B. Phipps	2841
	Aster sp.	H. Wild	2971
	Erigeron canadensis L.	J. B. Phipps	309
	Nidorella microcephala Steetz	J. B. Phipps	335
	Nidorella welwitschii S. Moore	J. B. Phipps	365
	Conyza aegyptiaca (L.) Ait.	A. V. Hall	262
	Conyza pinnata (L.) Kuntze	J. B. Phipps	423
	Blumea lacera (Burm. f.) DC. ex Wight	H. C. Taylor	1745
	Laggera sp.	A. R. A. Noel	2069
	Gnaphalium peregrinum Fern.	R. Goodier & J. B. Phipps	294
	Helichrysum adenocarpum DC.	Miss Weiste . . . SRGH	9141
	Helichrysum adscendens (Thunb.) Less.	J. B. Phipps	393
	Helichrysum brassii Brenan var. *aggregatum* Brenan	R. Goodier	201
	Helichrysum brunioides S. Moore, nom. illegit.	C. F. M. Swynnerton	1847
	Helichrysum sp. aff. *H. buchananii* Engl.	J. B. Phipps	364
	Helichrysum fulgidum (L.) Willd. var. *monocephalum* DC.	R. Watmough	146
	Helichrysum gazense (S. Moore) S. Moore	R. C. Munch	74
	Helichrysum kraussii Sch. Bip.	J. B. Phipps	704
	Helichrysum latifolium Less.	H. Wild	2917
	Helichrysum nitens Oliv. & Hiern	C. F. M. Swynnerton	?1836 1839 or 1840
	Helichrysum sp. nr. *H. nitens* Oliv. & Hiern	H. Wild	2875
	Helichrysum nudifolium (L.) Less.	J. B. Phipps	246
	Helichrysum nudifolium (L.) Less. var. *quinquenerve* (Thunb.) Moeser	J. B. Phipps	247
	Helichrysum petersii Oliv. & Hiern	H. Wild	2960
	Helichrysum setosum Harv. (? = *H. fulgidum* (L.) Willd.)	H. Wild	2942
	Helichrysum sulphureo-fuscum Bak.	J. B. Phipps	687
	Helichrysum umbraculigerum Less.	J. B. Phipps	400
	Helichrysum sp. no. 1	H. Wild	2852
	Helichrysum sp. no. 2	R. H. Finlay	7
	Helichrysum sp. no. 3	R. C. Munch	278
	Humea africana S. Moore	C. F. M. Swynnerton	1849
	Athrixia sp. = H. Wild 4602	Prince Edward School SRGH	43956
	Anisopappus flexuosus (Hutch.) Brenan	H. Wild	2876
	Anisopappus sp.	F. W. J. McCosh	9
	Acanthospermum brasilum Schrank	R. Goodier & J. B. Phipps	317
	Aspilia brachyphylla S. Moore	A. V. Hall	445
	Spilanthes mauritiana (Rich. ex Pers.) DC.	A. V. Hall	449
	Hypericophyllum compositarum Steetz	R. C. Munch . . SRGH	2109
	Bidens pilosa L.	A. V. Hall	444
	Schistostephium artemesiifolium Bak.	R. Goodier & J. B. Phipps	46

	Collector	Coll. No.
Schistostephium oxylobum S. Moore	J. B. Phipps	653
Lopholaena brickellioides S. Moore	C. F. M. Swynnerton	1802
Lopholaena sp.	Miss Weiste SRGH	9136
Crassocephalum rubens (Juss.) S. Moore	A. V. Hall	434
Crassocephalum telmatophilum (O. Hoffm.) Milne-Redh.	J. B. Phipps	268
Cineraria erosa Harv.	R. C. Munch	4
Cineraria sp. nr. *C. schimperi* Sch. Bip.	H. Wild	3621
Cineraria sp. No. 1	H. Wild	2867
Cineraria sp. No. 2	R. Watmough	141
Senecio discifolius Oliv. & Hiern	R. C. Munch SRGH	21006
Senecio erubescens Ait.	J. B. Phipps	250a
Senecio sp. aff. *S. erubescens* Ait.	J. B. Phipps	261
Senecio gazensis S. Moore	R. C. Munch	190
Senecio inornatus DC.	J. B. Phipps	344a
Senecio latifolius DC.	J. B. Phipps	385
Senecio oxyriifolius DC.	C. F. M. Swynnerton	1946
Senecio rosmarinifolius L.f.	R. Goodier & J. B. Phipps	206
Senecio propior S. Moore	C. F. M. Swynnerton	1879
Senecio variabilis Sch. Bip.	H. Wild	3549
Senecio sp. nr. *S. variabilis* Sch. Bip.	H. Wild	2918
Senecio verdoorniae R. A. Dyer	A. V. Hall	280
Kleinia galpinii (Hook. f.) A. Berg.	L. C. Leach	9059
Euryops sp.	H. Wild	2972
Chrysanthemoides monilifera (L.) Norlindh subsp. *septentrionalis* Norlindh	R. Goodier	640
Haplocarpha scaposa Harv.	R. C. Munch	172
Berkheya setifera DC.	J. B. Phipps	420
Berkheya zeyheri (Sond. & Harv.) Oliv. & Hiern	R. C. Munch	191
Dicoma anomala Sond.	N. C. Chase	6903
Gerberia abyssinica Sch. Bip.	R. C. Munch	168
Gerberia discolor Sond.	H. C. Taylor	1774
Gerberia piloselloides (L.) Cass.	R. C. Munch	200
Tolpis capensis Sch. Bip.	J. B. Phipps	320

REFERENCES

Copeland, E. H. (1947). *Genera Filicum.* Chronica Botanica, Waltham, Mass.

De Dalla Torre, C. G., and Harms, H. (1900-1907). *Genera Siphonogamarum.* Engelmann, Lipsiae.

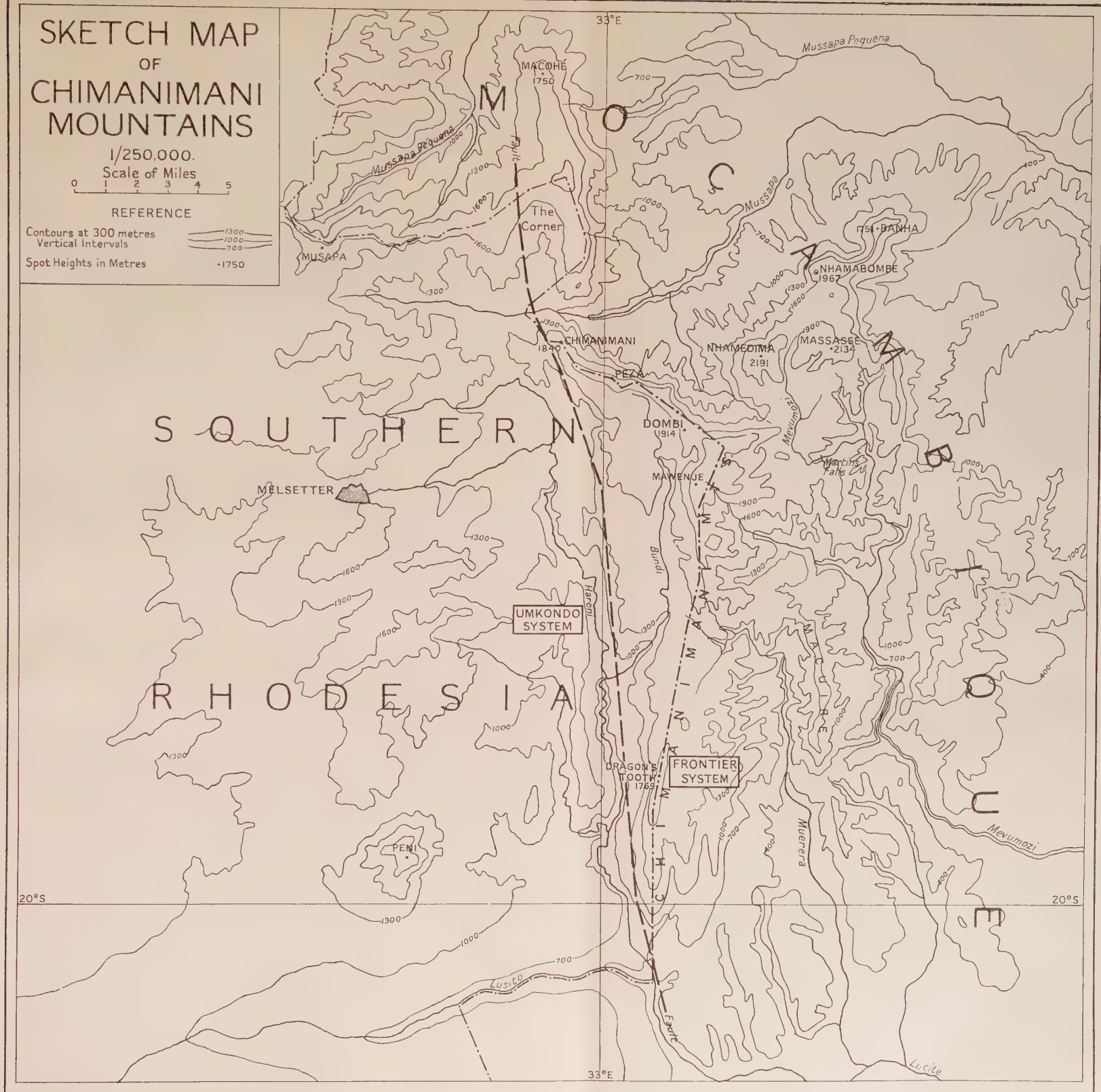
Exell, A. W., and Wild, H. (1960). *Flora Zambesiaca,* **1**, 1. Crown Agents for Overseas Governments and Administrations, London.

Hutchinson, J. (1959). *Families of Flowering Plants,* ed. 2. Oxford University Press.

Pilger, R. (1954). Das System der Gramineae. *Engl., Bot. Jahrb.* **76**, 281-384.

Rendle, A. B., et al. (1911). Flora of Gazaland. *Journ. Linn. Soc., Bot.* **40**, 1-245.

Tippo, O. (1942). *A Modern Classification of the Plant Kingdom.* Chronica Botanica, Waltham, Mass.



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CONTRIBUTION TO THE KNOWLEDGE OF THE *MELASTOMATOIDEAE* OF THE FEDERATION OF RHODESIA AND NYASALAND

by

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When we published the results of the revision of the specimens of *Melastomatoideae* existing in the herbaria of the National Herbarium of Pretoria (in Mem. Soc. Brot. **11**: 5-61, 1956), the Federal Herbarium, Salisbury, and the East African Herbarium, Nairobi *(loc. cit.:* 65-96), we had the opportunity to deal with several taxa of this sub-family collected in the area of the Federation of Rhodesia and Nyasaland. However, owing to the fact that in the herbaria of the Royal Botanic Gardens, Kew, the Department of Botany of the British Museum, London, and the East African Herbarium, Nairobi, there were several unnamed specimens collected in that region, the Directors of these Institutions have asked us to study this material also. Having accepted this kind invitation, we publish in this paper the results of our identifications.

Our studies have been made upon specimens collected by the following: *Mrs. F. M. Benson, B. D. Burtt, J. D. Chapman, N. C. Chase, I. B. P. Evans & J. Erens, F. Eyles, D. B. Fanshawe, Miss A. H. Gamwell, W. Gilges, H. B. Gilliland, P. J. Greenway, R. W. Jack, G. Jackson, P. Jeff, D. Kafuli, E. Lawrence, R. M. Lawton, E. W. B. H. Milne-Redhead, Mrs. E. J. Nash, E. I. Newman & T. C. Whitmore, J. M. Rattray, Mrs. H. M. Richards* (the most important collection), *Miss B. Saunders-Davies, C. F. M. Swynnerton* and *Mrs. J. Williamson.* The collectors are referred to in the text only by their surnames and these are followed by the number of the specimen as well as by the abbreviation of the name of the herbarium, respectively BM for British Museum, K for Royal Botanic Gardens of Kew, EA for the East African Herbarium and SRGH for the Federal Herbarium, Salisbury.

The classification of the tribes, genera and species is that followed in our paper referred to above. The localisation of the specimens follows the system used in the Flora Zambesiaca (see the map in this work).

Tribus—TIBOUCHINEAE

TIBOUCHINA Aubl.

Tibouchina semidecandra (Schr. & Mart. ex DC.) Cogn. in Mart., Fl. Bras. **14**, 3: 309; in A. & C. DC., Monogr. Phan.: 205 (1891).

SOUTHERN RHODESIA. C: Salisbury, alt. 1500 m., fl. iii.1918, *Eyles* 1355 (BM; SRGH).

Shrub introduced from Brazil and occasional as an escape from cultivation. This gathering was, however, taken from a cultivated specimen.

Tribus—OSBECKIEAE

ANTHEROTOMA Hook. f.

Antherotoma naudinii Hook. f. in Benth. & Hook. f., Gen. Pl. **1**: 745 (1865).

NORTHERN RHODESIA. N: Abercorn, Inono River, alt. 1200 m., fl. & fr. 1.ix.1956, *Richards* 6064 (K).

Widespread throughout tropical Africa, Transvaal, Natal and Madagascar. Small annual herb of savannahs.

MELASTOMASTRUM Naud.

Melastomastrum segregatum (Benth.) A. & R. Fernandes in Mem. Soc. Brot. **11**: 12 (1956).

forma **segregatum**

SOUTHERN RHODESIA. W: Victoria Falls, alt. 900 m., fl. & fr. 31.i.1934, *Saunders-Davies* s.n. (BM).

Tropical Africa. Shrub up to 3 m. tall of riverine fringes.

Melastomastrum capitatum (Vahl) A. & R. Fernandes in Garcia de Orta, **2**: 278, 1954.

Var. **capitatum**

NORTHERN RHODESIA. N: Kawambwa, Kalungwishi River, alt. 1050 m., fl. 26.iv.1957, *Richards* 9444 (COI; K).

Widespread throughout tropical Africa. Shrubby herb up to 1,5 m. high, growing by streams as well as in dry situations.

DISSOTIS Benth.

Dissotis debilis (Sond.) Triana in Trans. Linn. Soc. Lond. **28**: 58, t.4, *fig. 44a, b* (1871).

Var. **debilis**

forma **debilis**

NORTHERN RHODESIA. N: Shiwa Ngandu, alt. 1530 m., fl. & fr. 23.ix.1938, *Greenway* 5764 (EA); Abercorn, Kawimbe Dambo, fl. i.1954, *Nash* 17 (BM) (an *D. debilis* × *D. phaeotricha?);* Abercorn, Kawimbe Marsh, alt. 1680 m., fl. 1.xi.1956, *Richards* 6820 (K) (an *D. debilis* × *D. phaeotricha?);* Kawambwa, Timnatushi Falls, alt. 1260 m., fl. 19.iv.1957, *Richards* 9328 (K); Kawambwa, Mbereshi Road, alt. 1260 m., fl. 19.iv.1957, *Richards* 9333 (COI; K*). SOUTHERN RHODESIA. C: Marandellas, fl. v.1931, *Rattray* 4467 (BM; SRGH). NYASALAND. S: Pamalombe Plain, near Kundwelo village, alt. 630 m., fl. & fr. 29.vii.1956, *Newman & Whitmore* 298 (BM; SRGH).

Var. **pusilla** (R. E. Fries) A. & R. Fernandes in An. Junta Invest. Ultr. **10**, 3: 19 (1955).

forma **pusilla**

NORTHERN RHODESIA. N: Samfya, fl. & fr. 2.x.1953, *Fanshawe* 334 (K; SRGH); Abercorn, Lumi Marshes, alt. 1680 m., fl. 1.xi.1956, *Richards* 6831 (K).

Var. **lanceolata** (Cogn.) A. & R. Fernandes in Bol. Soc. Brot. Sér. 2, **29**: 49, *t. 3* (1955).

NORTHERN RHODESIA. N: Luwinga, alt. 1200 m., fl. iv.1922, *Jeff* 17 (BM); Mporokoso, Nsama, alt. 1200 m., fl. 3.iv.1957, *Richards* 8994 (COI; K); Abercorn, Ndundu, alt. 1680 m., fl. 2.v.1957, *Richards* 9491 (K).

Var. **pedicellata** A. & R. Fernandes, var. nov.

Affinis *D. debili* (Sond.) Triana var. *lanceolatae* (Cogn.) A. et R. Fernandes a qua ramis pilis sericeis densissime obtectis, foliis majoribus (usque ad 6 × 1,8 nec usque ad 1,2 × 0,5 cm.), inflorescentia laxiuscula, pedicellis longioribus, floribus majoribus, calycis tubo pilis omnibus simplicibus nec cum appendicibus apice penicillato-setose intermixtis obtecto, etc. differt.

Fl. Mart.

Icon. nostr. tab. V.

* In the Kew sheet one plant of forma *osbeckioides* A. & R. Fernandes was found.

Habitat in Rhodesia Boreali, prope Missionem loci dicti *Mpulungu*, in paludosis, alt. 840 m., 6.iii.1952, *Richards* 907 (K, holotypus).

"In wet marsh in open ground among grass and *Cyperaceae*, about 1 ft. high. Leaves with small flat white hairs. Stems hairy. Flowers in tight heads on very short pedicels. Flowers pale mauve".

The species is widespread in tropical Africa and in South Africa. Herb annual or perennial from a woody rootstock, up to 60 cm. high, in swamps, moist places and somewhat dry sandy soils.

Dissotis phaeotricha (Hochst.) Triana in Trans. Linn. Soc. Lond. **28**: 58 (1871).

Var. **phaeotricha**

forma **phaeotricha**

NORTHERN RHODESIA. N: Kawambwa, Masenga River, alt. 1200 m., fl. 18.iv.1957, *Richards* 9255 (COI; K).

Var. **villosissima** A. & R. Fernandes, var. nov.

Affinis *D. phaeotrichae* (Hochst.) Triana var. *hirsutae* (Cogn.) A. & R. Fernandes a qua caulibus, ramis et foliis pilis albidis subadpressis densissime obtectis nec setis fulvis ± dense hirsutis praecipue differt.

forma **villosissima**

Fl. Apr.

Icon. nostr. tab. VI.

Habitat in Rhodesia Boreali, *Mporokoso. distr.*, loco dicto *Mweru. Wantipa* pr. *Bulayo Chishyelo*, in paludosis, alt. 1050 m., 6.iv.1957, *Richards* 9065 (COI; K, holotypus).

"At side of swamp in very damp long grass. Stem pale brown, hairy. Flowers mauve".

forma **osbeckioides** A. & R. Fernandes, nov. forma

A typo staminibus subaequalibus differt.

Fl. Jan.

Habitat in Congo Belgica, loco dicto *Kisantu*, i.1948, *Callens* 775 (COI, holotypus).

The species is widespread in tropical Africa and in South Africa. Perennial herb up to 60 cm., in swamps and wet places.

Dissotis gracilis Cogn. in A. & C. DC., Monogr. Phan. **7**: 366 (1891).

NORTHERN RHODESIA. N: Mporokoso, near Mwita River, alt. 1350 m., fl. 1.iv.1957, *Richards* 8961 (COI; K).

Also in Angola and Katanga. Perennial herb of marshy places along rivers.

Dissotis rotundifolia (Sm.) Triana in Trans. Linn. Soc. Lond. **28**: 58 (1871).

NORTHERN RHODESIA. N: Kawambwa, Kafulwe, Lake Mweru, alt. 960 m., fl. 24.iv.1957, *Richards* 9428 (K); Abercorn, Mwenda Hills, alt. 1500 m., fl. & fr. 5.v.1957, *Richards* 9581 (K).

Widespread in tropical Africa. Perennial decumbent herb in moist or damp places in forests and along streams.

Dissotis johnstoniana Bak. f. in Trans. Linn. Soc. Lond. Ser. 2, **4**: 14, *t. 2, fig. 13-17* (1894).

Var. **johnstoniana**

NYASALAND. S: Mt. Mlanje, L. Ruo Plateau, alt. 1920 m., fl. & fr. 8.viii.1956, *Newman & Whitmore* 388 (BM; SRGH); Mt. Mlanje, Nayawani Forest, alt. 1920 m., fl. & fr. 23.viii.1956, *Newman & Whitmore* 535 (BM; SRGH); Mt. Mlanje, west face of Gt. Ruo Gorge, alt. 1110 m., fl. & fr. 29.viii.1956, *Newman & Whitmore* 626 (BM; SRGH).

Nyasaland and Mozambique. Shrub up to 2 m. high on open rocky slopes, in riverine forest or in degraded forest.

Var. **strigosa** Brenan in Mem. N. Y. Bot. Gard. **8**: 440 (1954).

NYASALAND. S: Mt. Mlanje, Tuchila Plateau, alt. 1800 m., fl. 21.vii.1956, *Newman & Whitmore* 100 (BM; SRGH); Mt. Mlanje, Tuchila Plateau, alt. 1950 m., fl. 25.vii.1956, *Newman & Whitmore* 200 (BM; SRGH).

This variety is known only from Nyasaland. Shrub to 2 m. high on rocky slopes.

Dissotis caloneura Gilg ex. Engl. in Engl. & Drude, Veg. Erde, IX, Pflanzenw. Afr. **3**, 2: 749 (1921).

Var. **caloneura**

NORTHERN RHODESIA. N: Abercorn, alt. 1350-1800 m., fl. 18.iv.1931, *Gamwell* XXX (BM); Abercorn, alt. 1500 m., fl. 28.iv.1952, *Richards* 1590 (K); 2 miles from Kasama, alt. 1200 m., fl. 31.iii.1955, *Richards* 5247 (K); Kawambwa, Timnatushi Falls, alt. 1260 m., fl. 19.iv.1957, *Richards* 9329 (K); Abercorn, Mwenda Hills, alt. 1500 m., fl. 5.ix.1957, *Richards* 9572 (K); Abercorn, Kambole Escarpment, alt. 1500 m., fl. & fr. 4.vi.1957, *Richards* 9987 (COI; K).

Also in Katanga. Shrub or small tree up to 3 m. high, growing in crevices of rocks or in sandy soil, often in open places.

Var. **pilosa** A. & R. Fernandes, var. nov.

A typo receptaculo extus setis brevibus, simplicibus, basi incrassatis, adpressis vel ± patulis, sparse vel densiuscule ornato, praecipue differt.

Fl.: Mart. et Maj.; fr. Maj.

Icon. nostr. tab. VII.

Habitat in Rhodesia Boreali, loco dicto *Luanshya,* in petrosis, 29.iii.1957, *Fanshawe* 3118 (K, holotypus), 3123 (EA; K).

"3 ft. high shrub of quartzite hills—lvs. 5-7 nerved, crenate, pub. —fls. pink-mauve in axill. and term. thyrses, showy" *(Fanshawe* 3118).

"8 ft. shrub with papery bark, crooked branches and flat-rounded crown of quartzite hills—lvs. 5-7 nerved, serrulate—fls. mauve-pink, shown in term, panicles" *(Fanshawe* 3123).

Etiam in Rhodesia Boreali, loco dicto *Chiwefwe,* in petrosis, l.v.1957, *Fanshawe* 3226 (K).

"Shrub to 4 ft. high of rocky quartzite hills—nodes apparent—lvs. ovate, 5-nerved, rugose—fls. purple, showy in terminal thyrse."

Dissotis melleri Hook. f. ex Triana in Trans. Linn. Soc. Lond. **28**: 58 (1871).

NORTHERN RHODESIA. N: Nyika Plateau, near Govt. Rest House, alt. 2100 m., fl. 24.ix.1956, *Benson* N.R. 172 (BM). NYASALAND. S: between Dedza and Ncheu, fl. 5.ix.1950, *Jackson* 201 (K).

Also in Tanganyika and Mozambique. Shrub or small tree often growing in the crevices of rocks.

Dissotis canescens (E. Mey. ex Graham) Hook f. in Oliv., Fl. Trop. Afr. **2**: 453 (1871).

NORTHERN RHODESIA. N: Lukupa River, 16 miles West of Kasama, fl. 11.vii.1958, *Lawton* 408 (K); Abercorn, Lunzuwa Falls, alt. 1650 m., fl. 19.vi.1955, *Nash* 142 (BM); Abercorn, Lumi River, alt. 1500 m., fl. 17.viii.1956, *Richards* 5843 (K); Abercorn, Nkali Dambo, alt. 1650 m., fl. 21.viii.1956, *Richards* 5891 (K); Abercorn, 10 miles from Kambole-Abercorn road, alt. 1500 m., fl. 29.viii.1956, *Richards* 5987 (COI; K); Abercorn, Kawimbe, near Machiwa-Kara road, alt. 1500 m., fl. 29.vii.1956, *Richards* 6021 (K); Abercorn, Fwambo, track Kawimbe-Abercorn, alt. 1500 m., fl. 3.ix.1956, *Richards* 6067 (COI; K); Abercorn, Old Abercorn-Sumbawanga road, 10 miles from Kawimbe, alt. 1620 m., fl. & fr. 7.ix.1956, *Richards* 6133 (COI; K). SOUTHERN RHODESIA. C: Salisbury, Cleveland Dam, alt. 1500 m., fl. ii.1917, *Eyles* 663 (BM;

SRGH); Marandellas, Shortland's Farm, fl. & fr. 1.iii.1933, *Rattray* 604 (BM; SRGH). E: near Chirinda, alt. 1140 m., fl. xii.1905, *Swynnerton* 296 (BM). NYASALAND. S: Mt. Mlanje, Malosa Valley, alt. 900 m., fl. 24.viii.1956, *Newman & Whitmore* 559 (BM; SRGH).

Widespread in tropical Africa and in South Africa. Undershrub up to 1,5 m., growing in damp places along streams.

Dissotis gilgiana De Wild. in Ann. Mus. Congo, Bot., Sér. 4, **1**: 217 (1903), non Hutch. & Dalz.

NORTHERN RHODESIA. W: Chingola, fl. 8.x.1954, *Fanshawe* 1608 (K).

Also in Katanga. Perennial herb to 0,5 m. tall, growing in swamps in dense clumps from a woody rootstock.

Dissotis macrocarpa Gilg in Engl., Monogr. Afr. Pfl.-Fam.-Gatt. II, Melastom.: 18 (1898).

NORTHERN RHODESIA. N: Abercorn, Lumi River, alt. 1680 m., fl. & fr. 31.v.1957, *Richards* 9950 (K); Abercorn, side of Lumi River, alt. 1680 m., fl. 12.vi.1957, *Richards* 10089 A (COI; K).

Also in Sudan Republic, Belgian Congo, Uganda, Kenya and Tanganyika. Low bush up to 1,2 m. high, in marshy places.

Dissotis degasparisiana Busc. & Musch. in Engl., Bot. Jahrb. **49**: 480 (1913).

NORTHERN RHODESIA. N: Abercorn, Kawimbe, marsh of Lumi River, alt. 1500 m., fl. & fr. 30.viii.1956, *Richards* 6073 (K); Abercorn, Kawimbe, Lumi River, alt. 1680 m., fl. 8.ii.1957, *Richards* 8109 (K); Abercorn, Lunzua Agriculture Station, alt. 1650 m., fl. 28.ii.1957, *Richards* 8401 (K).

Known only from Northern Rhodesia. Undershrub of about 1 m., in marshy places.

Dissotis pachytricha Gilg ex R. E. Fries in Wiss. Ergebn. Schwed. Rhod.-Kongo-Exped. 1911-1912, **1**: 180, *t. 13, fig. 7-11* (1914).

NORTHERN RHODESIA. N: Abercorn, Kalambo Escarpment, fl. & fr. 28.viii.1956, *Richards* 5939 (K); Kawambwa, near Kalungwishi River, alt. 1050 m., fl. 26.iv.1957, *Richards* 9443 (COI; K); near Mporokoso, alt. 1050 m., fl. 27.iv.1957, *Richards* 9458 (COI; K); Abercorn, Ndundu, alt. 1680 m., fl. & fr. 2.v.1957, *Richards* 9485 (K); Abercorn, track to Kara Village near Kawimbe, alt. 1680 m., fl. 4.v.1957, *Richards* 9551 (COI; K).

Also in Katanga and Tanganyika. Shrubby plant about 1,20 m. tall, growing in damp ground or in dry woodland.

Dissotis brazzae Cogn. in A. & C. DC., Monogr. Phan. **7**: 372 (1891).

NORTHERN RHODESIA. N: Kawambwa, road to Nchelengi, alt. 1200 m., fl. 20.iv.1957, *Richards* 9379 (COI; K).

Tropical Africa. Shrubby herb, up to 2 m. high, in moist or swampy places, savannahs and woodlands among tall grass.

Dissotis romiana De Wild., Comp. Kasai: 375 (1910).—A. & R. Fernandes in Bol. Soc. Brot. Sér. 2, **30**: 175, *t. 10* (1956).

NORTHERN RHODESIA. N: Abercorn, Kambole, Calongora River, alt. 1050 m., fl. 25.viii.1956, *Richards* 5972 (COI; K).

Also in the Belgian Congo. Shrub up to 2,5 m. high, along rivers.

Dissotis trothae Gilg in Engl., Monogr. Afr. Pfl.-Fam.-Gatt. II, Melastom.: 19, *t. 2, fig. B* (1898).

NORTHERN RHODESIA. N: Abercorn, Lunzuwa Falls, alt. 1650 m., fl. 19.vi.1955, *Nash* 143 (BM); Abercorn, Nkali Dambo, alt. 1650 m., fl. 21.viii.1956, *Richards* 5892 (COI; K); Abercorn, Nkali Dambo, alt. 1650 m., fl. 21.viii.1956, *Richards* 5893 (COI; K); Abercorn, Lake Chila, alt. 1620 m., fl. 28.v.1957, *Richards* 9925 (COI; K); Abercorn, Ndundu, alt. 1680 m., fl. & fr. 17.vi.1957, *Richards* 10071 (COI; K); Abercorn, Lumi River, alt. 1680 m., fl. 12.vi.1957, *Richards* 10086 (COI; K).

Also in the Belgian Congo, Ruanda-Urundi, Uganda and Tanganyika. Shrubby herb up to 3,5 m. high of the woodlands and banks of the lakes and rivers.

Dissotis irvingiana Hook. in Bot. Mag. **85**: *t. 5149* (1859).

Var. **irvingiana**

forma **irvingiana**

NYASALAND. N: Mugesse Forest Reserve, fl. & fr. 3.ix.1952, *Chapman* 15 (BM).

forma **abyssinica** (Gilg) A. & R. Fernandes in Garcia de Orta, **2**: 179 (1954).

NYASALAND. S: Mt. Mlanje, Malosa Valley, alt. 900 m., fl & fr. 24.viii.1956, *Newman & Whitmore* 561 (BM;SRGH); Mt. Mlanje, Gt. Ruo Gorge, alt. 750 m., fl. & fr. 29.viii.1956, *Newman & Whitmore* 639 (BM; SRGH).

The species is widespread in Tropical Africa. Shrubby herb up to 2 m. high, in moist places, evergreen forests, exposed slopes and dry bush.

Dissotis princeps (Bonpl.) Triana in Trans. Linn. Soc. Lond. **28**: 57 (1871).

Var. **princeps**

SOUTHERN RHODESIA. E: Melsetter, East Leigh Farm, fl. v.1939, *Jack* in GHS 5997 (BM; SRGH). S: 2 miles north of Zimbabwe fl. 28.v.1938, *Evans & Erens* 458 (K; SRGH). E: Central Patrol, Stapleford Forest Reserve, alt. 1755-1770 m., fl. & fr. 11.vi.1934, *Gilliland* 257 (BM; SRGH). E: Honde Valley, 1934, *Gilliland* 1147 (BM). NYASALAND. S: between Dedza and Ncheu, Lake View Road, fl. & fr. 5.ix.1950, *Jackson* 203 (K). S: Zomba Plateau, fl. 5.vi.1938, *Evans & Erens* 563 (K); Zomba Mts., Chawe Plateau, alt. 1500 m., fl. 17.v.1937, *Lawrence* 395 (K).

Var. **candolleana** (Cogn.) A. & R. Fernandes in Bol. Soc. Brot. Sér. 2, **29**: 56, *t. 9 & 10* (1955).

NORTHERN RHODESIA. W: Kitwe, fl. 6.iv.1957, *Fanshawe* 3150 (K); Kitwe, fr. 27.vii.1957, *Fanshawe* 3372 (K). SOUTHERN RHODESIA. E: Melsetter, alt. 1050 m., fl. & fr. 15.v.1953, *Chase* 4977 (BM). NYASALAND. N: Mubula, Misuku Hills, alt. 1350 m., fl. & fr. 11.xi. 1952, *Williamson* 88 (BM).

This species is to be found in tropical Africa, Swaziland and Natal. Shrub up to 2 m. tall, growing in swampy grasslands, along streams and sometimes in woodlands.

Dissotis denticulata A. & R. Fernandes in Bol. Soc. Brot. Sér. 2, **29**: 57, *t. 11* (1955).

NORTHERN RHODESIA. N: Shiwa Ngandu, fr. 5.ii.1955, *Fanshawe* 1992 (K); Chiwefwe, fl. & fr. 1.v.1957, *Fanshawe* 3224 (K); Kawambwa, fl. & fr. 5.viii.1958, *Fanshawe* 4642 (K); Kasama, fl. 10.iv.1958, *Fanshawe* 4863 (K); near Mporokoso, alt. 1050 m., fl. 27.iv.1957, *Richards* 9457 (COI; K); near Mporokoso, alt. 1050 m., fl. 27.iv.1957, *Richards* 9463 (COI; K).

Also in the Belgian Congo and Tanganyika. Shrub up to 1,20 m. tall in swampy grasslands, forests or river banks.

Dissotis falcipila Gilg in Engl., Monogr. Afr. Pfl.-Fam.-Gatt. II, Melastom.: 23, *t. 3, fig. A* (1898).

NORTHERN RHODESIA. N: Samfya, fl. & fr. 2.x.1953, *Fanshawe* 339 (K; SRGH); Kawambwa, fl. & fr. 12.vii.1957, *Fanshawe* 3406 (K).

Also in Angola and the Belgian Congo. Shrubby herb up to 1 m. high in swamps and along streams.

TRISTEMMA Commers.

Tristemma incompletum R. Br. in Tuckey, Narr. Exped. Zaire: 435 (1818).

NORTHERN RHODESIA. N: Abercorn, Mbulu River, alt. 1500 m., fl. & fr. 5.ii.1957, *Richards* 8068 (K).

Widespread in tropical Africa. Undershrub growing in forests, in shady and moist places.

DICHAETANTHERA Endl.

Dichaetanthera corymbosa (Cogn.) Jacq.-Fél. in Bull. Soc. Bot. Fr. **102**: 38 (1955).

NORTHERN RHODESIA. N: Kawambwa, fl. 23.viii.1957, *Fanshawe* 3584 (EA; K; SRGH).

Also in Angola, Belgian Congo and Uganda. Tree about 12 m. tall and 20 cm. diam., in riverine forests.

Dichaetanthera erici-rosenii (R. E. Fries) A. & R. Fernandes in Bol. Soc. Brot. Sér. 2, **30**: 181, *t. 16 & 17* (1956).

NORTHERN RHODESIA. N: Abercorn, Kalambo road, alt. 1650 m., fl. & fr. 28.ix.1955, *Kafuli* 25 (BM); Abercorn, Kambole Escarpment, alt. 1620 m., fl. 26.viii.1956, *Richards* 5974 (K); Abercorn, Kalambo Falls, alt. 1500 m., fl. 15.ix.1956, *Richards* 6208 (COI; K); Abercorn, Kalambo River, alt. 1200 m., fl. 16.ix.1956, *Richards* 6210 (COI; K); Mporokoso, Nsama, alt. 900 m., fl. & fr. 21.ix.1956, *Richards* 6237 (COI; K).

Also in Tanganyika. Small tree 4.5-6 m. tall, without leaves when flowering, growing among rocks.

Dichaetanthera rhodesiensis A. & R. Fernandes in Bol. Soc. Brot. Sér. 2, **30**: 182, *t. 18, 19 & 20* (1956).

NORTHERN RHODESIA. W: Mwinilunga, R. Wamibobo, fl. 7.viii,1930, *Milne-Redhead* 849 (K); Mwinilunga, SW. of Matonchi Farm towards R. Ysongailu, fl. x, xi.1937, fr. ii.1938, *Milne-Redhead* 3232 (K).

Known only from Northern Rhodesia. Small tree about 3 m. high, without leaves when flowering, on rocky ground.

Tab. V.—**Dissotis debilis** (Sond.) Triana var. **pedicellata** A. & R. Fernandes (Specimen *Richards* 907)

Tab. VI.—**Dissotis phaeotricha** (Hochst.) Triana var. **villosissima** A. & R. Fernandes (Specimen *Richards* 9065)

Tab. VII.—**Dissotis caloneura** Gilg ex Engl. var **pilosa** A. & R. Fernandes (Specimen *Fanshawe* 3118)

THE GENUS *MONOCHORIA* PRESL (PONTEDERIACEAE) IN AFRICA

by

B. VERDCOURT

East African Herbarium, Nairobi

During the course of writing up the family Pontederiaceae for the Flora of Tropical East Africa, my attention was drawn to the fact that the specimens of *Monochoria* collected in West Africa clearly did not belong to the same taxon as those which had been collected in East Africa. Very little material has been collected in Africa at all and the attention of collectors is particularly drawn to the fact that a great deal more is required. Spirit material of the flowers is required, or at least separate flowers should be carefully pressed, so that the width of the tepals is easily measured.

The first specimen of the genus to be found in Africa was obtained by Schweinfurth and was described by Solms-Laubach in his excellent monograph as *Monochoria vaginalis* (Burm. f.) Presl ex Kunth var. *africana* Solms-Laubach. When revising the group for the Flora of Tropical Africa, N. E. Brown raised this variety to specific rank and I agree with this course. Hutchinson and Dalziel record further specimens of the genus from West Africa and refer them to *M. vaginalis* (Burm. f.) Presl ex Kunth var. *plantaginea* Solms-Laubach, a variety described from Java. Dr. van Steenis in the Flora Malesiana, in an addition made to an account of the family written by Dr. Backer, has again suggested that the African plants should be regarded as forming a variety of the Asiatic *M. vaginalis*. I believe he came to this conclusion after studying a sheet from Portuguese Guinea, which I have since had on loan from Leiden.

There is no doubt in my mind that the Asiatic, East African and West African plants of the *M. vaginalis* group belong to three distinct taxa; what one calls them is a matter of opinion—they might quite easily, and perhaps correctly, all be referred to subspecies of *M. vaginalis*, or all three could be separate species, or one could sort them into two species, one of which was regarded as having two subspecies. The differences are clearly bound up with geographical distribution, so the term variety is not desirable. The matter is one which probably would not be settled even after careful cultivation since it is a matter of choice. I have considered that all three plants belong to separate species and have described the West African species as new.

The following key will serve to distinguish the three and the distributions of the African species are shown on the map (Fig. 1).

1. Leaves of flowering shoots ovate, clearly cordate, with long petioles, usually longer or much longer than the inflorescences 2

1. Leaves of flowering shoots lanceolate or elliptic, cuneate at the base; terete part of petiole above the sheath very short; inflorescences usually overtopping leaves of flowering shoots ... ... *Monochoria brevipetiolata*, sp. nov.

2. Inflorescences short, subumbellate ... *Monochoria vaginalis*

Inflorescences much longer; spikes almost as long as the leaves ... ... *Monochoria africana*

Monochoria africana *(Solms-Laubach) N. E. Brown* in Fl. of Trop. Africa **8**: 5 (1901); Schwartz in Engl., Bot. Jahrb., **61**, Beibl.: 139, 36 (1927); Andrews, Fl. Pl. Sudan **3**: 278 (1956).

M. vaginalis (Burm. f.) Presl ex Kunth var. *africana* Solms-Laubach in Mon. Phan. **4**, 525 (1883).

This species is characterised by its long spikes of flowers which are often almost as long as the leaves of the flowering shoots, and the ovate-cordate leaves with long petioles. It is widely distributed in East Africa, but only very few gatherings have been made. See Tab. VIII.

SUDAN. Equatoria, Jur Ghattas, 22 Aug., 1869, *Schweinfurth* 2296 (B, holo.†; K, iso.).

KENYA. Tana River District, south bank of R. Tana near Ozi, on the margins of rice fields at the foot of earth dams in cleared *Bruguiera, Hunteria, Rhizophora, Avicennia* mangrove swamp forest, 8 Nov., 1957, *Greenway & Rawlins* 9483 (EA; K): aquatic herb to 0.9 m. tall, flowers blue-bell-coloured, held erectly.

TRANSVAAL. Kruger National Park, Leeupan, in shallow water at the edge of the pan, 7 Feb., 1955, *v.d. Schijff* 4193 (K; PRE): flowers blue (plate 1). Eastern Transvaal, Gomandwane, midway between Lower Sabie and Crocodile Bridge, c. 31°51′E, 25°15′S, Jan., 1937, *Stevenson-Hamilton* in N.H. 22811 (K; PRE): "noticed in various places, these specimens were taken from a pool which is dry in winter and holds water only from Nov. until May".

Monochoria brevipetiolata *Verdcourt*, sp. nov.
[*M. vaginalis* var. *plantaginea sensu* Hutch. & Dalz. in Fl. West Trop. Afr. **2**, 354 (1936) *non* Solms-Laubach.]

Affinis *M. africanae* (Solms-Laubach) N.E. Br. foliis angustioribus, lanceolatis vel ovato-lanceolatis, basi haud cordatis, petiolis foliorum floralium brevioribus, tepalis haud punctatis differt.

Herba rhizomata, paludosa, perennis, glabra, 45-75 cm. alta. *Folia radicalia* longe petiolata, petiolis c. 20 cm. longis, lamina lanceolata vel ovato-lanceolata, apice longe acuminata, basi rotundata vel cuneata, c. 7-9 cm. longa et 3.2-4 cm. lata. *Folia floralia* breve petiolata, petiolis

liberis 1.2-1.6(−3) cm. longis, vaginis 3.5-4.5 cm. longis, lamina lanceolata, apice longe acuminata, basi cuneata, 4.5-11 cm. longa et 1-2.8 cm. lata. *Racemi* elongati, 10-20-flori, usque 15 cm. longi, pedicellis demum 5 mm. longis. *Perigonium* subhexaphyllum, lobis caeruleis, 1-1.4 cm. longus. *Capsula* oblongo-ellipsoidea, apice mucronata, 10 mm. longa 9-13 mm. latis, margine tenuibus. *Stamina* 6, anthera mediana inferior ceteris subduplo major, 5 mm. longa, filamento introrsum calcari plano adscendente aucto; antherae parvae 3.5-4 mm. longae. *Ovarium* ellipsoideum 5 mm. longum et 3.5 mm. latum, stylus filiformis, 6 mm. longus. *Capsula* oblongo-ellipsoidea, apice mucronata, 10 mm. longa et 4 mm. lata, in perianthio persistente inclusa. *Semina* numerosa, brunnea, 1.7 mm. longa et 1.2 mm. lata, valde costata.

SENEGAL. North Tambacounda, *Chevalier* 33965 (not seen).

FRENCH GUINEA. Region of Kindia, May, 1913, collector's name not deciphered (ex Herb. de *Ch. d'Alleizette)* (L) (Tab. X). Hutchinson and Dalziel cite another specimen which I have not seen, Kankan, *Pobeguin* 1107 (K).

GAMBIA. Near Bansang, 1952, *Duke* 14 (K, in spirit): flowers blue.

PORTUGUESE GUINEA. Gabú, depressoes alagadas de savana entre Pitche e Canquelifá, 18 Sept., 1950, *Santo* 2777 (K, holotype): erva anual aquática (Tab. IX).

Between the raphe, which is adnate to the testa, and the testa itself are masses of bundles of silvery raphide crystals.

Although Dr. van Steenis suggests that *M. africana* is only a race of *M. vaginalis* (Tab. XI and XII), I am keeping them specifically distinct. The West African species just described differs more from either *M. africana* or *M. vaginalis* than they do from each other. Apart from its distinct distribution, all the material I have seen has the flowering leaves with very short petioles; all the leaves have cuneate or rounded bases as distinct from the very cordate bases found in the leaves of *M. africana* and most of the leaves of *M. vaginalis*; the perianth lobes are usually broader and lack the marked black dots which are scattered in the median part of the lobes in *M. africana.* It is true that ovate-lanceolate leaves are sometimes found in *M. vaginalis* in plants growing under unfavourable conditions, but these still have very short inflorescences and long petioles to the leaves of flowering shoots. The differences are too constant and too linked with geographical distribution to follow any course other than to maintain the three taxa as distinct species or subspecies. I prefer to regard them as species.

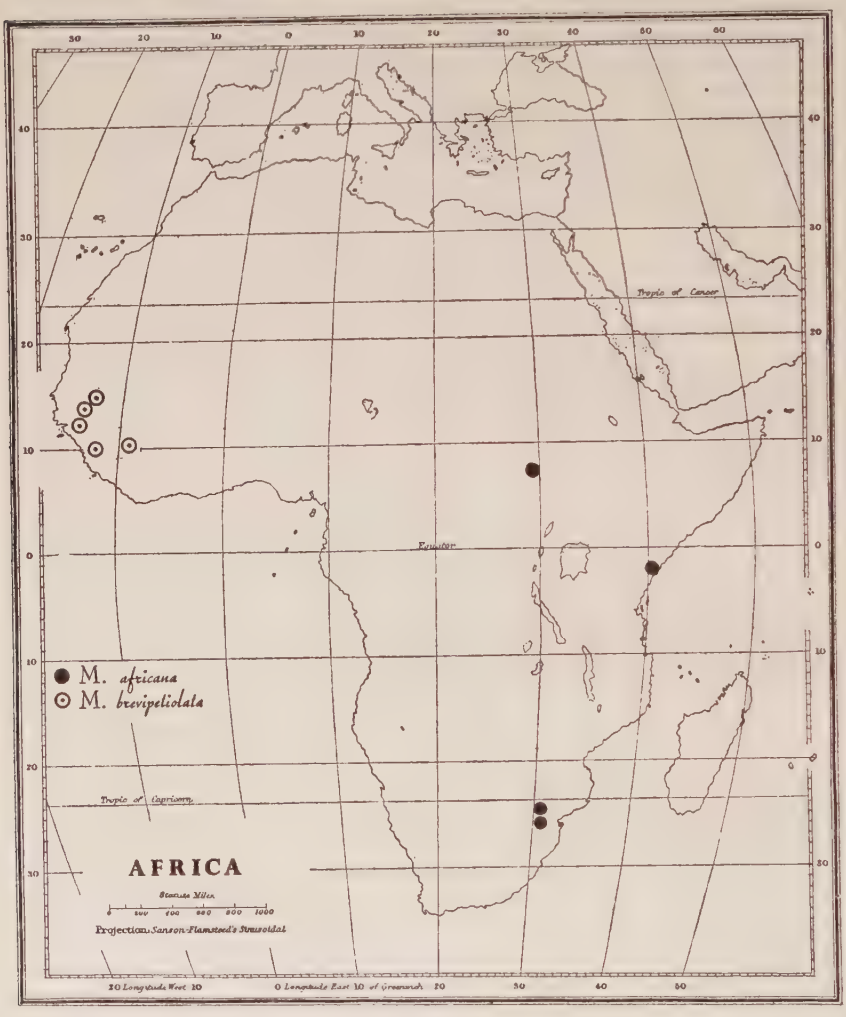

Fig. 1. Map showing distribution of the genus *Monochoria* Presl in Africa.

Tab. VIII. *Monochoria africana* (Solms-Laubach) N.E.Br.
Transvaal, Kruger National Park, *v. d. Schijff* 4193 (Kew sheet).

Tab. IX. *Monochoria brevipetiolata* Verdcourt, sp. nov.
Portuguese Guinea, Gabú, between Pitche and Canquelifá, *Santo* 2777 (Kew sheet) (holotype).

Tab. X. *Monochoria brevipetiolata* Verdcourt, sp. nov.
French Guinea, Kindia, *Herbier de Ch. d'Alleizette* (Leiden sheet).

IPHIGENIA AND CAMPTORRHIZA IN SOUTHERN AFRICA

by

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These two genera looking so alike vegetatively have often been confused in herbaria. The taxonomy was also in need of a revision.

The genus *Iphigenia* was described in 1843 by Kunth, Enum, *4*: 212 for two Indian species previously classified under *Melanthium* L. The type species, *I. indica* (L.) Kunth, comes from India. Our solitary species, *I. bechuanica* Bak., shows great similarity in the structure of the flower and in general appearance to this Indian species and is best kept in this genus. Although I have seen no tropical African material, it is likely that our species will link up with those found further north.

In 1935, Dr. E. P. Phillips, noting the striking difference between true *Iphigenia* and a species named *I. schlechteri* Engl., placed it in a new genus, which he called *Camptorrhiza*, the name referring to the unusual knee-shaped tuber. A careful examination of the South African material showed it to be a monotypic genus although it had received five names. *Iphigenia strumosa* Bak. which was described in 1898, is the oldest name and the new combination *Camptorrhiza strumosa* (Bak.) Oberm. therefore has to be made.

Schinz in Mitt. Bot. Mus. Univ. Zürich, **60:** 533 (1912) had already drawn attention to the fact that *I. dinteri* Damm., *I. schlechteri* Engl. and *I. junodii* Schinz were synonyms of *I. strumosa* Bak.

A year after Phillips' publication of the genus *Camptorrhiza*, Buzbaum in Bot. Archiv **38:** 228 (1936) also published a new genus *Iphigeniopsis*, for this group of plants. It must therefore be regarded as a synonym.

Key to *Iphigenia* and *Camptorrhiza*:—

Underground part a small ovoid tunicated corm; filaments filiform; style short with three revolute papillate stigmas . . . *Iphigenia.*

Underground part consisting of a young ovoid corm with attached to it a knee-shaped horizontal tuber from the previous season; filaments with a thick bulge in the middle; style long with a small, apical stigma . . . . . *Camptorrhiza.*

Iphigenia bechuanica Bak. in Fl. Trop. Afr. **7:** 562 (1898). Type: Bechuanaland, near Kwebe, *Lugard* 81 (K, holo.). Although I did not see the holotype, there is a specimen *Lugard* s.n. at GRA which bears this name apparently in Baker's handwriting. *I. stenotepala* Krause in Engl., Bot Jahrb. **51:** 440 (1914). Type: South West Africa, Grootfontein dist. Tsumeb, edge of a shallow pan, *Dinter* 2486 (B, holo?; NBG iso.!).

Small wispy plants up to 40 cm. tall. *Corm* ovoid ca. 15 mm. in diam. with the outer tunics brown and papery. *Stem* straight or flexuose with 1-2 tubular bracts at the base. *Leaves* ascending widely spaced in a lax spiral, base tubular, lamina narrowly linear up to 15 cm. long and 5 mm. broad but usually much smaller, ribbed, ending in an elongated tip. *Flowers* 6-10, axillary in upper part, cernuous; pedicels patent with the apex recurved, up to 4 cm. long. *Perianth* deciduous, greenish brown or greenish purple; segments filiform, ca 1 cm. long, spreading in mature flower. *Stamens* with filiform filaments up to 2 mm. long, anthers basifixed, extrorse. *Ovary* ovoid, over-topping the stamens, with many (ca. 20) ovules; style very short with three crook-shaped papillate stigmatic branches, persisting for a long time to the apex of one valve. *Capsule* round to cylindrical depending on the number of seeds developed, 8-17 mm. long, 6 mm. wide. *Seeds* many, small, round, 1 mm. in diam. dark brown, papillate with a distinct raphe from the funicle to a pointed projection.

Distribution:— Mozambisue, Transvaal, Southern Rhodesia, Bechuanaland, South West Africa. Rare, solitary plants.

MOZAMBIQUE. Quelimane, *Sim* 20607.

TRANSVAAL. Nelspruit: Kruger National Park, 7 m.E.N.E. of Pretoriuskop, Lowveld, sour Bushveld, rare, *Acocks* 16631. Sibasa: Kruger National Park 3 m.N. of Kloppersfontein, mopaniveld on black turf, rare, *Acocks* 16781.

SOUTHERN RHODESIA. Umtali: Tsungwezi River, Romsey Estates, in shallow soil over granite, *Wild* 4655. Urungwe: 1 m.N. of Muana River, mopani-mfuti ecotone, occasional, *Phipps* 963. Sebungwe: Longwalala River, Mopani woodland, *Lovemore* 167. Darwin: Umvukwes, Umsengedzi River, in sand on river bank, *Wild* 3968. Bulalima Mangwe: Plumtree, *McLeod* 8; Empandeni, *Feiertag* (SRGH 45413).

NORTHERN RHODESIA. Mazabuka, *Robinson* 2546.

BECHUANALAND. Near Kwebe. *Lugard* s.n. (GRA).

SOUTH-WEST AFRICA. Grootfontein: Tsumeb, on edge of a shallow pan, *Dinter* 2486 (NBG, iso!).

Camptorrhiza Phillips in Fl. Pl. of Africa, **15:** t.575 (1935).

Iphigeniopsis F. Buxb. in Bot. Archiv **38:** 228 (1936).*

C. strumosa Bak. Oberm., comb, nov.

Iphigenia strumosa Bak. in Fl. Trop. Afr. **7:** 562 (1898). Type: Bechuanaland, Kwebe, *Lugard* 59 (K, holo.; NBG, iso.!). *I. junodii* Schinz in Mém. Herb. Boiss. **10**, 28 (1900). Type: Mozambique, Delagoa Bay, hills at Rikatla, *Junod* 128 (z. holo.). *I. schlechteri* Engl., Bot. Jahrb. **32:** 89 (1902). Type: Mozambique, Lourenço Marques in sandy areas, *Schlechter* 11525 (B, holo? PRE, iso.!). *I. flexuosa* Bak. in Bull. Herb. Boiss. Ser. 2. **4:** 996 (1904). Type: South-West Africa, between Etiro and Karibib, *Rautanen* 435 (Z, holo.). *I. dinteri* U. Damm. in Engl., Bot. Jahrb. **48:** 361 (1913). *I. dinteri* U. Damm. ex Schinz in Viert. Nat. Ges. Zürich **56:** 93 (1911) nom. Type: South-West Africa, Windhoek: Brakwater on Omaheke sand, *Dinter* 1556 (B, syn.?); Okanhandja in deep fine quartz, *Dinter* 359 (B. syn.?; NBG, iso.!).

Iphigeniopsis strumosa (Bak.) Buxb. in Bot. Archiv **38:** 264 (1936).

I. junodii (Schinz) Buzb., l.c. *I. schlechteri* (Engl.) Buxb., l.c. *I. flexuosa* (Bak.) Buxb., l.c. (syn. *I. dinteri* Damm.).

Slender glaucous plants 5-40 cm. high. *Corm* ovoid with a knee-shaped horizontal tuber of the previous year attached to it. *Stems* flexuose, leafless in lower part but covered by a tubular bract. *Leaves* ascending, somewhat fleshy, lamina slightly folded, emerging from a long tubular leafsheath, linear, 5-15 cm. long, 5 mm. broad, apex acute.

Flowers forming a loose apical raceme with the upper axillary leaves reduced; pedicels erect in flower, looped downwards in fruit, 2.5 cm. long. *Perianth* deciduous, patent or reflexed, depending on stage of development, pale mauve and green with oblong, apiculate segments 3.5 mm. long, 1.5 mm. broad. *Stamens* opposite the segments, with very short filaments which have an orbicular swelling in the middle, anthers versatile. *Ovary* ovoid with many ovules; style about as long as the ovary, semi-persistent, stimga minute, apical. *Capsule* globose to cylindrical, up to 20 mm. long, 15 mm. broad but usually smaller, with grey-brown thin walls. *Seeds* oblong-rounded, 3 by 4 mm., minutely papillate, brownish, raphe ending in a small apiculus at the opposite end of the funicle.

Distribution.—Mozambique, Transvaal, Southern Rhodesia, Bechuanaland, South-West Africa. Usually gregarious.

MOZAMBIQUE.—Delagoa Bay, Rikatla, *Junod* 96. Lourenço Marques, *Borle* 135.

* I would like to thank Mr. A. Sölch for giving me a summary of the contents of Buxbaum's article at Bot. Archiv is not available in South Africa.

SOUTHERN RHODESIA.—Melsetter: Chipinga, grasslands, *Chase* 1862. Umtali: Sabi Drift, Odzi Road, in sandy soil, *Wild* 4659.

TRANSVAAL.—Kruger National Park, Sibasa: Baiandbai, *Lang* TM 32231, TM 32157. Nelspruit: Shabinkop, Lowveld, sourveld on granite sheets in shallow soil, *Acocks* 16666; Pami-onca, *van der Schijff* 2423. Middelburg: Brugspruit, *Schlechter* 3759. Pretoria: Willow Park, *Strey*. Klerksdorp, *Sister Catherine*.

BECHUANALAND.—Ngamiland, *Curson* 287.

SOUTH-WEST AFRICA.—Okahandja: *Bradfield* 308.

Species excluded: *Iphigenia ramosissima* Engl. & Krause in Engl., Bot. Jahrb. **45**:124 (1910) proved to be a Cyanella, i.e. *Cyanella ramosissima* (Engl. & Krause) Engl. & Krause in Engl., Bot. Jahrb.**57**:239 (1921).

The loan of material from the Compton Herbarium, the Federal Herbarium, Salisbury and the Albany Museum is gratefully acknowledged.

A NEW GENUS OF ORCHIDS FROM SOUTHERN RHODESIA

by

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In 1949 we received at Kew from the Salisbury Herbarium in Southern Rhodesia a dried specimen, accompanied by material in liquid preservative, of a *Bulbophyllum*-like plant which had been collected by Mr. N. C. Chase in the Honde Gorge, north of Umtali, on the eastern border of Southern Rhodesia.

Pressure of other work prevented me from examining this plant at all closely and I had provisionally written it down as a new, albeit remarkable, species of *Bulbophyllum*. In its long creeping rhizome bearing at intervals heteroblastic pseudobulbs with closely placed apical leaves, and inflorescences arising laterally at the base of the pseudobulb, as well as in the general external appearance of the flowers, it agrees well with *Bulbophyllum*. The most obvious and indeed striking difference is in the number of leaves at the apex of each pseudobulb, for whereas in *Bulbophyllum* there are usually 1 or 2, very rarely 3 leaves, in the present plant there are over 6 and as many as 11, all narrow and fleshy rather like small needles of a conifer.

On closer investigation of the flower it appears that in general structure the plant closely resembles *Bulbophyllum*, especially the mobile labellum attached to a distinct column foot and the winged column with distinct stelidia at its apex. There is one important feature, however, in which our plant differs from *Bulbophyllum*. Here there are only two large flattened bun-shaped pollinia whereas in *Bulbophyllum* the number of pollinia is always 4 in 2 pairs, though the two forming each pair may sometimes be partially united to one another.

In view of these striking differences, both in vegetative and in floral characters, from *Bulbophyllum*, it seems best to treat the plant as a distinct genus which I am calling *Chaseëlla* in honour of the collector, whose extensive collections have contributed so much to our knowledge of Rhodesian plants. The genus is clearly related to *Bulbophyllum*.

Chaseëlla Summerhayes, gen. nov.

Epiphytica. *Caulis* repens, sub pseudobulbis radices emittens. *Pseudobulbi* ± distantes, heteroblasti, apice plurifoliati. *Folia* patentia, fasciculata, ± subulata, aciculis *Pini* similia sed multo minora. *Scapus* e basi pseudobulbi exoriens, 1-2-florus. *Flores* resupinati. *Sepala* libera, inter se ± aequalia, lateralia obliqua, cum pede columnae adnata. *Petala* quam sepala minora. *Labellum* mobile, simplex, ecallosum. *Columna* erecta, anguste alata, stelidiis brevibus triangularibus, pede distincto incurvato; androclinium excavatum; anthera ovoidea, antice retusa, polliniis duobus compressis exappendiculatis; fovea stigmatica quadrata.

Species unica, Rhodesiae orientalis incola.

Chaseëlla pseudohydra Summerhayes, sp. nov.

Herba epiphytica nana; rhizoma repens, circiter 1 mm. diametro, vaginis arctissimis obtusis dissitis obsessum, sub pseudobulbis radices fasciculatas flexuosas graciles emittens. *Pseudobulbi* usque 2 cm. distantes, erecti, oblongoideo-ovoidei, valde rugosi, usque 8 mm. longi et 5 mm. diametro, apice 6-11-phylli. *Folia* patentia, fasciculata, breviter aciculata, dorsiventraliter compressa, carnosa, apice acuta, usque 8 mm. longa et 1 mm. diametro. *Scapus* e basi pseudobulbi exoriens, gracilis, pseudobulbo duplo altior, apice 1-2-florus; pedunculus teres, vaginis arctis instructus, 1-1.5 cm. longus; bracteae laxe vaginantes, ovatae, breviter acuminatae, pedicello cum ovario fere aequilongae. *Flores* fere scssiles, lateritii; pedicellus cum ovario 3 mm. longus, pilis nigris furfuraceis instructus. *Sepalum* intermedium leviter incurvatum, valde convexum, anguste ovatum, subacutum, circiter 4 mm. longum et 3 mm. latum; sepala lateralia incurvata, oblique ovata, apice breviter acuminata, circiter 4 mm. longa et 3.5 mm. lata, cum pede columnae adnata mentum rotundatum circiter 3.5 mm. longum formantia; omnia sepala trinervia. *Petala* erecta, elliptica, apice rotundata, circiter 1.75 mm. longa et 1.25 mm. lata, uninervia. *Labellum* mobile, modice recurvatum, late ovatum, basi leviter cordatum, medio depressum sed vix canaliculatum, 2-2.5 mm. longum et latum, subcarnosum, ecallosum. *Columna* incurvata. circiter 1.5 mm. alta, anguste alata, alis supra medium obtusissime angulatis, stelidiis triangularibus apice oblique truncatis acutis circiter 1 mm. longis, pede incurvato 1.5 mm. longo; androclinium $\pm$ excavatum; anthera ovoidea, antice quadratim excavata, dorso papillosa, fere 1 mm. longa, polliniis duobus compressis fere orbicularibus uno latere applanatis exappendiculatis 0.5 mm. longis; fovea stigmatica quadrata.

SOUTHERN RHODESIA. Umtali Distr., Honde Gorge, epiphyte on trees, Feb. 1949, *Chase* S. Rhod. Gov. Herb. 22738 (type in Herb. Kew.)

The fleshy ovoid pseudobulb and bunch of radiating narrow green leaves at its apex are remarkably reminiscent of the coelenterate genus *Hydra*, on a much larger scale, and the specific epithet is chosen in view of this similarity.

THE GENUS RITCHIEA IN EAST AND WEST AFRICA

by

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In connection with the preparation of the account of the Capparidaceae for the Flora of Tropical East Africa, it has been necessary to investigate the taxonomic status of the plants hitherto variously called *Ritchiea insignis, R. insculpta,* and *R. Bussei.* These names seem to belong to a single taxon, which is, furthermore, apparently conspecific with a common and widely distributed plant of West Africa and the Congo Basin. Based on collections from West and East Africa alone, some eight epithets have been applied to this taxon in the past. To determine the correct name for the East African plants, it was necessary to investigate all of these epithets. Since there has been, in recent years, a large accumulation of specimens of the various other species of *Ritchiea,* it has seemed advantageous at the same time to evaluate those names which have been applied in the Flora of West Tropical Africa, and the Flora Zambesiaca, as well as in East Africa. I have not attempted to include either the names used in the Belgian Congo or in Angola, which do not, in any event, affect the priority of the names used here. Detailed distributional data and citation of specimens are given only for Tropical East Africa. For other areas, the appropriate published floras should be consulted.

Despite the rather large amount of material that we now have available for study, there is still a great deal that we do not know about the plants of this genus. Much more, much more complete, and much better annotated, material is necessary before any conclusions can or to the definition of infraspecific categories. For example, for more than half of the species we are ignorant of the nature of the mature fruit; it is impossible to tell from the dried material now available whether, in some or all of the species, the anterior and posterior pairs of petals are of different lengths; we know very little about the habit or habitat of most species, and what we do know is frequently apparently contradictory. Finally, the specific distinctness of a number of plants, now dignified with specific epithets, known only from one or a few incomplete specimens, from areas that are not well collected, remains to be demonstrated.

Our needs as regards new collections are as follows: (1) flowers should be preserved in liquid or very carefully spread out and quickly dried so as to demonstrate the size and shape of the petals, both relative and absolute; (2) wherever possible flowering and fruiting material should be obtained from the same plants; if more than one plant is found in a given area, collections should be taken from all, or at least several, to show the range of variation; (3) habit and habitat should be noted in considerable detail; it should be particularly noted

whether inflorescences are only terminal on leafy shoots, or stems, or whether leafless lateral inflorescences occur as well. In this genus, as in the other genera of the Capparidaceae, the mature fruit may be expected to throw considerable light on the interrelationships of the taxa.

The delimitation of, and the definition of the term, "species", is, at best, a controversial subject, While most systematists are agreed that the species is a group of individuals, the limits of the group, i.e., the amount of individual variation allowed within groups of individuals, are subject to considerable debate. Anderson (Evolution, 11 (2) : 260-262 (1957), however, in an extremely interesting paper, makes a case that this debate is more vocal than real. He demonstrates that, in well studied (temperate) areas there tends to be near unanimity of opinion and judgment on the limits of nearly all species. The exceptions to this unanimity are to be found in those groups which are known, or strongly suspected, to have abnormalities in the matter of their reproduction.

It is difficult to conceive of any characteristic in which tropical plants behave essentially differently than temperate zone ones. The reaction to cold in a seasonal climate seems inherently similar to the reaction to drought in a monsoon area. Photo-periodicity seems to be a factor in the growth of some tropical plants, just as it is for some temperate zone plants. The same kinds of cells and organs occur in both tropical and temperate plants. The physiology and morphology of tropical and temperate zone plants seems, then, to be fundamentally identical. One may assume, therefore, that in the tropics one will find discrete groups of individuals such as one finds in the temperate zone. One assumes that with sufficient data we may reach near unanimity on the circumscription of these taxa. Similarly, we must expect to find some few taxa whose variation pattern is confused by reproductive abnormalities of various kinds. Whatever the situation, a sufficiency of data, and study, will elucidate the problem, even if it does not suggest a ready answer.

Experimental studies indicate very strongly that variation in the plant kingdom is not continuous. Rather, it indicates that this kingdom is composed of a multitude of discrete groups of individuals. The taxonomic hierarchy is predicted on the hypothesis that these groups can themselves be grouped. Again, experimental studies show that at least up to the rank of genus, the taxonomic hierarchy based on morphological similarity is an essentially true picture of the facts of nature, i.e., the consanguinity of the plants themselves (cf. Clausen, J.—stages in the Evolution of Plant Species, pp. 206, Cornell University Press, 1951).

We recognize the various taxa not only by the distinct morphological discontinuities between the groups, but also by the morphological (and physiological) characters that the individual members of the group have in common. In the delimitation of taxa it is more important to demonstrate a general dissimilarity between two groups of individuals than to indicate a single striking discontinuity in a single individual.

Taxa, then, are discrete groups of individuals sharing a large number of common characteristics, and delimited from other such groups of individuals by distinct discontinuities in their pattern of variation and in the absolute expression of certain of the characteristics. These groups are concrete and real facts of nature. They are not arbitrary concepts of the individual human mind having no absolute fixed or fixable boundaries. Given such discrete groups, the only room for argument is the rank to which they are to be assigned. Taxa of the same rank may consist of few individuals, or many; the various individuals may be relatitvely uniform in facies, or they may be extremely variable; the causes of individual uniformity or variability are themselves various. However, the experience of the past two hundred years assures us that, given a sufficiency of data, taxa can be delimited accurately to the (nearly) unanimous satisfaction of all botanists (cf. Hedberg, O.—Afroalpine Vascular Plants, Symb. Bot., xv (1) : 1-411 (1957), esp. pp. 11-17; Du Reitz., G. E.—The Fundamental Units of Biological Taxonomy, Svensk. Bot. Tidskr., 24 : 333-428 (1930)).

The one essential for accurate delimitation of species (or other taxa) is a sufficiency of data (collections) for study. At the moment, the Ritchieas of Angola and Northern Rhodesia are very poorly known. There are several epithets attached to one or a few isolated specimens. These few specimens do not show obvious, sharp, discontinuities from the West African *R. capparoides*. The plants referred to *R. Gossweileri* in the Flora Zambesiaca are best treated as representing *R. capparoides* (sens. lat.). The populations to which this name, and the other names to which it is compared, are referred are very poorly known, and their specific distinctness remains to be demonstrated on the basis of more ample material. It may well be that some or all of these plants are distinct from *R. capparoides* (sens. strict.). We cannot, at present, demonstrate this point.

RITCHIEA R. Br. ex G. Don*

Ritchiea R. Br. (in Denham & Clapperton, Trav., append. : 225 (1826), (nom, nud.) ex G. Don, Gen. Syst., 1: 276 (1831) "Richiea".

Shrubs, sometimes with flexuous branches, vines, or small trees with simple or 3-5 foliolate leaves. Inflorescence a few—many flowered lateral, pseudo-terminal or terminal raceme or corymb. Receptacle or calyx tube shallow and bowl-like. Aestivation valvate. Disk a scarcely perceptible overgrowth at the base of the calyx tube. Petals generally, but not always, present, more or less linear-oblong. Stamens 20-60 on an androphore about as long as the calyx tube. Ovary cylindrical. Fruit more or less fusiform with longitudinal grooves or ridges, reputed to be tardily dehiscent.

*Where the bibliographical references are reduced to initials they are those currently in use in the *Flora of Tropical East Africa.*

1. Leaves always simple 2
   Leaves 1-5 foliolate, or simple and 1-5 foliolate on the same twig 4
2. Leaves oblong-oblanceolate, oblong-elliptic, or oblong-lanceolate; gynophore 15-30 mm. long; petals 4, or 8-14 3
   Leaves ovate or lanceolate; gynophore 30-35 mm. long; petals 4 ... ... *reflexa*
3. Sepals always less than 15 mm. long, petals 4, pediceles 2-5 mm. long ... ... *aprevaliana*
   Sepals generally 15 mm. or more long, petals 8 or more, pedicels 5-25 mm. long. ... ... *simplicifolia*
4. Petals absent, dwarf shrub with a thickened, woody rootstalk and annual leafy shoots with a terminal inflorescence ... ... *pygmaea*
   Petals present, erect or scrambling shrubs or small trees 5
5. Inflorescence a terminal or sub-terminal raceme at the apex of a leafy shoot 6
   Inflorescence a lateral, or pseudo-terminal, not congested, raceme on a leafless rhachis ... ... *capparoides*
6. Raceme congested, many flowered, petals 8 or more ... ... *erecta*
   Raceme not congested, few flowered, petals 4 or many 7
7. Sepals 5-10 mm. wide x 12-20 mm. long, petals 15-30 mm. long; gynophore 20-30 mm. long; shrubs or small trees of altitudes above 3,000 ft. ... ... *albersii*
   Sepals 8-15 mm. wide x 20-30 mm. long, petals 30-60 mm. long; gynophore 25-40 mm. long; scramblers, shrubs, or small trees of altitudes below 3,000 ft. ... ... *capparoides*

   (petals 4=var. *capparoides*

   petals 8 or more=*longipedunculata*)

Ritchiea aprevaliana (De Wild. & Th. Dur.) R. Wilczek, F.C.B. **2:** 477 (1951). Type: Belgian Congo, Bassan-Koussou, *A. Dewevre*, s.n. (?784) 1895 (present location unknown, fide F.C.B. **2**: 477, 1951).

Maerua aprevaliana De Wild. & Th. Dur., Ann. Mus. Cong. Bot. (Sér. II) **1**: 5-6 (1899); Engl., Bot. Jahrb. **53**: 261 (1915); Fl. Sperm. Parc Nat. Alb. **1**: 208 (1948). Type as above.

Under shrub to 3 m. tall, or liane. Leaves simple, clustered at the nodes or at the ends of the branches. Petiole 10-15 mm. long, lamina 55-180 mm. wide x 200-350 mm. long, oblanceolate, base cuneate, apex acuminate. Flowers borne in short (15-60 mm.) lateral racemes. Pedicels 2-5 mm. long. Sepals 4, 8-12 mm. long, about 4 mm. wide, oblong lanceolate. Petals 4, oblong-lanceolate, to 14-20 mm. long, 1-2 mm. wide. Stamens about 20, 15-17 mm. long. Gynophore 15-20 mm. long. Ovary cylindrical or ovoid, about 3 mm. long. Fruit (fide F.C.B.) ovoid, 14-30 mm. long with 1-5 seeds.

UGANDA—Bunyoro District: Budongo Forest, Jan., 1931, Brasnett no. 441 sheet II!; and Jan. 1940, Eggeling 3856!. Widespread, but apparently rare, in the forests of the Congo Basin. In East Africa reported so far only from the Budongo Forest in Uganda.

Ritchiea pygmaea (Gilg) DeWolf, comb. nov. Type: Tanganyika, Songea, Kilwa District, Kwa-Mponda, 21 Dec., 1900, *Busse* 618 (B, holo!) (EA, holo fragment!)

Maerua pygmaea Gilg in Eng., Bot. Jahrb. **33**: 228 (1903); Engl., Bot. Jahrb. **53**: 243 (1915); Brenan, T.T.C.L. : 117 (1949); F.C.B. 2: 490 (1951); Fl. Zamb. **1** (1): 224 (1960). Type as above.

A dwarf shrub with a woody root stalk and erect or decumbent, leafy, annual or perennial stems to 0.5 m. long or tall. Leaves 3-5 foliolate, petioles 50-80 mm. long, petiolules 2-5 mm. long, leaflets obovate to oblanceolate 35-55 mm. wide x 100-140 mm. long. Inflorescence a leafless raceme, lateral or pseudo-terminal on the vegetative stems of the preceding year, or arising directly from the root stalk. Pedicels 10-20 mm. long. Calyx tube about 4 mm. long. Sepals 10-20 mm. long, 5-7 mm. wide oblong-elliptic. Petals absent. Stamens 50 or more on an androphore scarcely longer than the calyx tube. Gynophore about 20 mm. long at anthesis. Ovary glabrous, shortly cylindrical to oblong-cylindrical, about 3 mm. long. Mature fruit not known.

TANGANYIKA—Lindi District: Lutamba Lake. Sept., 1934, *Schlieben* 5203 (BM.!); Mahiwa Experimental Farm, 14 Dec., 1955, *Milne-Redhead* and *Taylor* 7490! Farm 36, Nachingwa, Nov., 1952, *Evans* 28 (EA!). Known also from Mozambique and extreme south-eastern Belgian Congo (Haut Katanga).

The cup-shaped calyx tube and the large, thin-textured, 3-5 foliolate leaves clearly indicate the relationship of this species to the genus *Ritchiea*. The immature fruit on Allen, no. 7, are more suggestive of the fruit of a *Ritchiea* than those of a *Maerua*. The lack of petals is not a character of generic importance in the African woody *Capparidaceae*, since petaloid and apetalous forms occur both in *Maerua* and *Cadaba*. It is not surprising to find it here in this most strongly reduced member of *Ritchiea*.

The development of erect, annual stems from a woody, subterranean, fire resistant, root stalk has taken place on three occasions in the related genus *Maerua*. The genus *Courbonea* was distinguished from the simple-leaved species of *Maerua* by this habit, and by the extreme reduction of the length of the placentas and the number of ovules to 4 per ovary. In a species of *Maerua*, detected by the late R. A. Graham, and as yet unpublished, this habit has also been assumed. Finally, *Maerua oblongifolia* (Forsk.) A. Rich. is a large scrambling shrub in the eastern part of its range, but a suffrutex in West Africa.

Ritchiea capparoides (Afzelius ex Evans apud Andrews) Britten in Journ of Bot. **55**: 279 (1917); F.W.T.A. (ed. 2) **1**: 92 (1954) Type. A plant cultivated by T. Evans, Esq., at Stepney. Collected by Dr. Afzelius in Sierria Leone in 1795. Andrews, Bot. Rep.: t. clxxvi (1801).

Crataeva capparoides Afzelius ex Evans apud Andrews, Bot. Rep.: t. clxxvi (1801). Type as above.

Crataeva fragrans Afzelius ex Sims, Bot. Mag. **16**: t. 596 (1802).

Ritchiea fragrans (Afzelius ex Sims) R. Br. ex G. Don, Gen. Syst. **1**: 276-277 (1831) (as Richiea); Hooker, Niger Flora: 217 (1849); F. T. A. **1**: 100-101 (1868), pro parte excl. syn.; Durand & Schinz, Conspectus Fl. Afr. **1** (2): 177 (1898), excl. syn. (Ritschiaea); Durand & Durand, Sylloge Fl. Cong.: 32 (1909), excl. syn.; Lane-Poole, Trees Shrubs, Herbs, and Climbers of Sierra Leone: 84 (1916); F. W. T. A. (ed. 1) **1**: 87 (1927); F. W. T. A. App.: 22 (1937); A. Chev., Fl. Viv. de L'Afr. O. F. **1**: 181-182 (1938); Roberty, Petite Fl. de L'Ouest Afr.: 278 (1954). Type as above.

Maerua insignis Pax in Engl., Pflanzenw. Ost-Afr. **C**: 187 (1895). Type: Tanganyika, Tanga Province, Lushoto District, Sigi bei Kwa Kischihiri, 20 Jan., 1893, *Volkens* 30 (B, holo.; K, photo.!).

Ritchiea werthiana Gilg in Werth, Veg. Ins. Sansibar: 48 (1901). Type: Zanzibar, Uroa, *Werth* s.n. (B, holo.!).

Ritchiea fragariodora Gilg, Engl., Bot. Jahrb. **33**: 207 (1903); F. W. T. A. (ed. 1) **1**: 87 (1927); F. C. B. **2**: 472-473 (1951); F. W. T. A. (ed. 2) **1**: 92 (1954). Type: Cameroon, Yaunde (Yaounde), Jan., 1894-1895, *Zenker* 666 (B, syn.! BM, iso-syn.!); Mar., 1894-95, *Zenker* 668 (B, syn.).

Ritchiea insignis (Pax) Gilg, in Engl., Bot. Jahrb. **33**: 209 (1903); Gilg & Bened. in Engl., Bot. Jahrb. **53**: 179 (1915); Brenan, T. T. C. L.: 120 (1949); Fl. Zamb. **1** (1): 242-244 and t. 38, fig. A (1960). Type as *Maerua insignis* above.

Ritchiea bussei Gilg in Engl., Bot. Jahrb. **33**: 209 (1903); R. E. Fr., Wiss. Ergebn. Schwed. Rhod.-Kongo Exped. **1**: 50 (1914); Gilg & Bened. in Engl., Bot. Jahrb. **53**: 179 (1915); Brenan, T. T. C. L.: 120 (1949). Type: Tanganyika, Donde District, Mitumbati, 14 Dec., 1900, *Busse* 588 (B, holo.!; EA, iso.!).

Ritchiea insculpta Gilg & Bened. in Engl., Bot. Jahrb. **53**: 179-180 (1915); Brenan, T. T. C. L.: 120 (1949). Type: Tanganyika, Lushoto District, Bomole, Feb., 1913, *Grote* 3884 (B, syn.!); zwischen Amani und Kwamkoro, Jan., 1909, *Kranzlin* 2155 (B, syn.!); nach Nyussi, *Braun* 2085 (B. syn.).

Shrub, scrambler, or small tree to 5 m. or more high or long. Leaves (1-) 3-foliolate, petiole 15-65 mm. long, petiolule 2-7 mm. long, leaflets 25-100 mm. wide × 60-150 mm. long, broadly elliptic, lanceolate, obovate, or oblanceolate; base rounded or broadly deltoid, generally slightly inequalateral; apex acute or slightly acuminate. The terminal or median leaflet the largest. Inflorescence on short leafless lateral branches or at the apex of elongate leafy branches. Pedicel 15-80 mm. long. Sepals 4; 8-15 mm. wide and 20-30 mm. long, lanceolate to elliptic, generally ciliate on the margin. Petals 30-60 mm. long, clawed, linear-oblong. Stamens many, 20-35 mm. long. Ovary cylindrical or ± fusiform, glabrous 4-5 mm. long. Fruit more or less cylindrical, 4-grooved, to 60 mm. long and 25 mm. in diameter.

Var. **capparoides**

Petals 4

In or at the edge of evergreen forest, or in riverside thickets, from Senegal to Angola eastward through the Belgian Congo to Haut Katanga; in Northern Rhodesia from Lake Mweru and the Abercorn District. From extreme north-eastern Mozambique along the coastal plain to Kilifi. Also on Zanzibar.

Var. **longipedicellata** (Gilg) DeWolf, stat. nov.

Petals 8 or more

Ritchiea longipedicellata Gilg in Engl., Bot. Jahrb. **33**: 211 (1903); Gilg & Bened. in Engl., Bot. Jahrb. **53**: 181 (1915); F. W. T. A. (ed. 1) **1**: 86-87 (1927); Chev., Fl. Viv. **1**: 182 (1938); F. W. T. A. (ed. 2) **1**: 91 (1954). Type: Nigeria, Lagos, 9 Oct., 1891, *Millen* 8 (B, holo.; K, photo!).

Togo, Dahomey and Southern Nigeria, also Lake Mweru, N. Rhodesia (*Fanshawe* 3680).

Ritchiea capparoides has a remarkably uniform facies in spite of considerable individual variation in size, and shape of leaves. East African specimens tend to have shorter pedicels and more lateral veins in the leaves, but individual gatherings cannot be localized by these characters. Var. *longipedicellata* can be recognized surely only by the number of petals. Petal length, pedicel length, gynophore length and number of lateral veins in the leaves all fall within the range of variation of the West African specimens of var. *capparoides*.

Ritchiea albersii Gilg in Engl., Bot. Jahrb. **33**: 208-209 (1903); Gilg & Bened. in Engl., Bot. Jahrb. **53**: 178-179 (1915); T. S. K.: 13 (1936); I. T. U.: 40 (1940); Fl. Parc Nat. Alb. **1**: 200 (1948); Brenan, T. T. C. L.:

120 (1949); Fl. Pl. A.-E. Sudan. **1**: 52 (1950); F. C. B. II: 476 (1951); I. T. U. (ed. 2): 77-78 (1952); F. W. T. A. (ed. 2): **1**: 92 (1954). Type: Tanganyika, Lushoto District, Kwai, Mar., 1899, *Albers* 95 (B. holo.; K, photo!).

Ritchiea steudneri Gilg in Engl., Bot. Jahrb. **33**: 208 (1903); Gilg & Bened. in Engl., Bot. Jahrb. **53**: 178 (1915); Miss. di studio al Lago Tana **7**: 43 (1951). Type: Ethiopia, Gondar, Feb., 1862, *Steudner* 1196 (B, holo.!).

Ritchiea macrocarpa Gilg in Engl., Bot. Jahrb. **33**: 211-212 (1903); Gilg & Bened. in Engl., Bot. Jahrb. **53**: 182 (1915); F. W. T. A. (ed. 1) **1**: 87 (1927). Types: British Cameroons, Cameroon Mtn., Buea, 16 Apr., 1898, *Lehmbach* 180; 17 Apr., 1898, *Lehmbach* 223 (B, holos.; K. photos!).

Ritchiea stella-aethiopica Pax in Engl., Bot. Jahrb. **39**: 620 (1907). Type: Ethiopia, Godjam, Tschamoya, 30 Apr., 1905, *F. Rosen* (B, holo., fragment).

Ritchiea chlorantha Gilg in Wiss. Ergebn. Zentr.-Afr. Exped. 1907-08 **2**: 215 (1914); Gilg & Bened. in Engl., Bot. Jahrb. **53**: 178 (1915). Type: Tanganyika, Mohasi-See West, 25 July, 1907, *Mildbraed* 638 (B, holo.!).

Ritchiea mildbraedii Gilg in Wiss. Ergebn. Zentr.-Afr. Exped. 1907-08 **2**: 216 (1914); Gilg & Bened. in Engl., Bot. Jahrb **53**: 178 (1915). Type: Ruanda, Kissenyi District, Bugoie, 29 Oct., 1907, *Mildbraed* 1420a! and 1423a (B, syn.).

Ritchiea apiculata Gilg & Bened. in Engl., Bot. Jahrb. **53**: 177 (1915). Type: Cameroons, Mao Bika, Dodo, 6 Mar., 1909, *Ledermann* 2892 (B, holo.; K, photo!).

Ritchiea pentaphylla sensu F. W. Andrews, Fl. Pl. A.-E. Sudan **1**: 52 (1950) non Gilg & Bened.

Shrub or tree up to 15 m. tall. Leaves simple to 5-foliolate. Petioles 15-120 mm. long Petiolules 2-5 mm. long. Leaflets elliptic or oblong-elliptic, 20-80 mm. wide × 45-205 mm. long, the smallest leaflet sometimes smaller. Base cuneate or deltoid. Inflorescence at the apex of elongate, leafy branches. Pedicels 15-35 mm. long. Sepals 5-10 mm. wide × 12-20 mm. long, lanceolate or ovate, ciliate on the margin. Petals 15-30 mm. long, linear-oblong with an acuminate apex. The posterior pair may be longer than the others, observation on fresh material is needed on this point. Stamens many, 20-30 mm. long. Gynophore 20-30 mm. long. Ovary 3-5 mm. long. Fruit cylindrical or spindle-shaped, with 6 grooves or ridges, to 50 mm. long and 25 mm. in diameter.

Fairly common in evergreen forest above 1,000 m. from Cameroons Mtn. to Central Ethiopia and southward to Lake Bangweulu (N. Rhod.) and Vumba Mtns. (S. Rhod.).

Ritchiea erecta Vogel ex Hook. fil. apud. Planchon in Ic. Pl. **8**: t. 769, 770 (1848); Niger Fl.: 216 et t. 19-20 (1849); Gilg & Bened. in Engl., Bot. Jahrb. **53**: 181 (1915); F. W. T. A. (ed. 1) **1**: 86 (1927); (ed. 2) **1**: 91 (1954). Type: Fernando Po, Nov., 1841, *Vogel* 227 (K, holo.!).

Ritchiea polypetala Hook. fil. in Bot. Mag.; t. 5344 (1862); Gilg & Bened. in Engl., Bot. Jahrb. **53**: 180 (1915); F. W. T. A. (ed. 1) **1**: 86-87 (1927); (ed. 2) **1**: 91 (1954). Type: Hort. Kew. ex W. Africa 1862 (K, holo.!).

Ritchiea glossopetala Gilg in Engl., Bot. Jahrb. **33**: 210 (1903); Gilg. & Bened. in Engl., Bot. Jahrb. **53**: 182 (1915); F. W. T. A. (ed. 1) **1**: 86-87 (1927). Type: Cameroon, Victoria, 27 Oct., 1896, *Preuss* s.n. (B, holo.).

Ritchiea caloneura Gilg in Engl., Bot. Jahrb. **33**: 210-211 (1903); Gilg. & Bened. in Engl., Bot. Jahrb. **53**: 181 (1915). Type: Cameroon, Bipinde, *Zenker* 1253 (B, holo.; BM, iso.!).

Ritchiea pentaphylla Gilg & Bened. in Engl., Bot. Jahrb. **53**: 180-181 (1915); F. W. T. A. (ed. 1) **1**: 86 (1927); (ed. 2) **1**: 91 (1954). Type: Nigeria, Lagos, Jan., 1893, *Millen* 102 (B, holo.; K, iso.!).

Ritchiea oreophila Gilg & Bened. in Eng., Bot. Jahrb. **53**: 181-182 (1915). Type: Cameroons, Nlonako, 27 Nov., 1909, *Ledermann* 6332 (B, holo.; K, photo.!).

Ritchiea obanensis Hutch. & Dalziel, F. W. T. A. (ed. 1) **1**: 86 (1927); Kew. Bull. (1928): 25 (1928). Type: Nigeria, Oban District, 1911-12, *Mr. & Mrs. P. A. Talbot* 58 bis (K, holo.!).

Small shrub 1-2 m. tall. Leaves 3-5 foliolate. Petiole 80-155 mm. long, petiolules 5-15 mm. long. Leaflets 45-90 mm. wide × 100-240 mm. long, oblong-elliptic or oblong-oblanceolate, base cuneate, attenuate; apex acuminate. Inflorescence a stout, dense, congested, many flowered, terminal or pseudo-terminal raceme. Inflorescence bracts 5-15 mm. long, generally pubescent. Pedicels 15-50 mm. long, pubescent. Sepals 5-10 mm. wide × 15-28 mm. long. Petals 8 or more, 30-70 mm. long × 2-3 mm. wide, linear or linear oblong. Stamens many, 30-35 mm. long. Gynophore 20-40 mm. long. Ovary cylindrical or slightly fusiform 4-5 mm. long, with a prominent turbinate stigma. Fruit unknown.

Coastal plain of Nigeria, British Cameroons and Fernando Po.

Ritchiea simplicifolia Oliv., F. T. A. **1**: 100 (1868); Gilg & Bened. in Engl., Bot. Jahrb. **53**: 183 (1915); F. W. T. A. (ed. 1) **1**: 86-87 (1927); (ed. 2) **1**: 91 (1954). Type: British Cameroons, Cameroons River, Jan., 1863, *Mann* 2190 (K, holo.!).

Ritchiea brachypoda Gilg in Engl., Bot. Jahrb. **33**: 213 (1903); Gilg & Bened. in Engl., Bot. Jahrb. **53**: 183 (1915); F. W. T. A. (ed. 2) **1**: 91 (1954). Type: British Cameroons, Barombi, between Mafura and Mambanda, 24 Dec., 1888, *Preuss* 50 (B, holo.; K, photo!).

Shrub to 2 m. tall, leaves simple (or unifoliolate!), oblanceolate, oblong-elliptic, elliptic or lanceolate, apex acuminate, base cuneate, 45-90 mm. long. Petiole 7-16 mm. Flowers whitish or greenish, borne on very short, leafless, lateral or pseudo-terminal, few-flowered racemes. Pedicels 15-25 mm. long, minutely puberulent. Sepals 6-10 mm. wide × 15-20 mm. long, petals 8 or more, linear-oblong, 50-60 mm. long, about 4 mm. wide, stamens 25-35 mm. long. Gynophore 20-30 mm. long. Ovary narrowly fusiform 4-5 mm. Fruit unknown.

British Cameroons and Spanish Guinea.

Ritchiea reflexa (Schum. & Thonn.) Gilg & Bened. in Engl., Bot. Jahrb. **53**: 183 (1915); F. W. T. A. (ed. 1) **1**: 86-87 (1927); Irvine, Pl. Gold Coast: 372 (1930); Chevalier, Fl. Viv. de L'A. O. F. **1**: 182 (1938); F. W. T. A. (ed. 2) **1**: 91-92 (1954); Roberty, Petite Fl.: 278 (1954) sub *R. fragrans*. Type: Gold Coast, *Thonning* (C, holo.!).

Capparis reflexa Schum. et Thonn., K. Dansk. Vid. Selks. (Afh.) 3-4: 237 (1828). Types as above.

Maerua grandiflora Pax in Engl., Bot. Jahrb. **14**: 302 (1891). Type: Gold Coast, Adafa, 1888, *Krause* 14 (B, holo.!).

Ritchiea grandiflora (Pax) Gilg in Engl., Bot. Jahrb. **33**: 213 (1903). Type as above.

Scandent shrub. Leaves simple, ovate or lanceolate, base rounded or broadly deltoid, apex acute or very shortly acuminate, 30-70 mm. wide × 60-130 mm. long. Petioles 8-12 mm. long. Flowers white. Inflorescence a few-flowered raceme either lateral, or terminal on a lateral leafy shoot. Pedicels 20-35 mm. long, glabrous or minutely puberulent. Sepals 7-8 mm. wide × 18-20 mm. long. Petals 4, linear or linear spathulate, to 50 mm. long and about 4 mm. broad. Stamens about 30 mm. long. Gynophore 30-35 mm. long. Ovary narrowly fusiform 3-4 mm. long. Fruit unknown.

French Guinea to Togoland, in grasslands both near the coast and inland.

NEW AND INTERESTING TAXA FROM SOUTHERN AFRICA

by

J. G. Anderson, L. E. Codd, R. A. Dyer, M. D. Henderson, D. J. B. Killick and B. de Winter

National Herbarium, Pretoria

GRAMINEAE

Eragrostis acraea de Winter, sp. nov., *E. grandi* Hilleb. affinis, sed floribus spicularum paucioribus, lemmatibus omnino scaberulis, carinis palearum subtiliter scaberulis differt.

Gramen perenne, robustum, caespitosum, ad 2 m. altum. *Culmi* plerumque 1-nodosi, internodio superiore longo exserto, basi culmis vaginis dense indutis; vaginae ad 40 cm. longae; ligulae ciliatae; laminae foliorum lineares, ad 60 cm. longae, saepe expansae, *Panicula* elongata, 15-70 cm. longa, 5-20 cm. lata, ramis omnibus angulatis scaberulis ascendentibus in pseudoverticillis in rachi robusta dispositis. *Spiculae* oblongo-ellipticae, 4-6 mm. longae, olivaceo-incanae; rhachilla persistens. *Flores* hermaphroditi. *Glumae* subaequales, scaberulae. *Lemmata* navicularia, scaberula, acuta. *Paleae* lemmatibus subaequales, firmae, 2-carinatae, apice membranaceae. *Stamina* 3. *Ovarium* glabrum; styli 2. *Caryopsis* oblongo-elliptica, circiter 1 mm. longa; embryo 0.5 mm. longus.

SOUTHERN RHODESIA—Inyanga: *Pole Evans* sn.; Blue Mountain Farm, *Miller* 3789. Umtali: Vumba Mountains, *Fisher* 1108; edge of Vumba Forest, *Pole Evans* 16; Vumba Mountains, common on grassy slopes, Dec., 1937, Obermeyer, 2046 (BOL; K; PRE, holo.; SRGH); Mount Nuza, *Gilliland* 428; Mount Nuza, *Gilliland* 326. Melsetter: Martin Forest Reserve, *Barret* 50/55 (G.H.S. 56722); Martin Forest Reserve, *Stables* (G.H.S. 56669); Glencoe Forest Reserve, *Armitage* 91/55; Rolanda River Falls, *Pedro* 411; no locality, *Cronwright* in *Eyles* 2962. Chipinga: 12 m. N. of Chipinga on mountain top, *Mapham* 49.

TRANSVAAL—Pilgrims Rest: "Op die Berg" 21 m. N. of Graskop, *Codd* 6745. Pietersburg: Blouberg, rocky kloof, *Codd & Dyer* 9074; Blouberg, *Codd* 8769; Blouberg, *H. G. Schweickerdt* 1987. Waterberg: Kranzberg, farm Groothoek, *Codd* 4808. Rustenburg: Castle Gorge, *Chippindall* 306.

Tall, very robust, broad-leaved, densely tufted perennial. *Culms* up to 2.0 m. high, solid glabrous usually one-noded, usually unbranched or occasionally with one or two branches near the base, lower internode short, upper very long much exceeding the sheaths and bearing the panicle, bases of the culms tightly enclosed by a dense layer of persis-

tent basal sheaths; sheaths pallid or purple, smooth and shiny or faintly striate, sparsely pilose or glabrous, up to 40 cm. long; ligule a fimbriate rim; blades linear and tapering to a fine point, expanded or rolled, up to 60 cm. long (usually 20-30 cm.) and up to 1.3 cm. wide, sparsely pilose or glabrous, finely striate below, ribbed above. *Panicle* contracted or with branches spreading, much longer than wide, 15-70 cm. long and up to 20 cm. wide, all divisions angular and densely scabrid with hyaline spines on the angles; rachis well developed and much thicker than the branches, branches approximate and in pseudo-whorls usually obliquely spreading at a 30° angle with the rachis, filiform with the branchlets usually somewhat appressed. *Spikelets* pedicelled more or less crowded on the branchlets, oblong to oblong-elliptic in outline with *Lemmas* 2.2-2.7 mm. long, boatshaped, ovate in outline when flattened, 1.5-2.0 mm. wide, 5-7 flowered; rhachilla persistent. *Florets* falling entire, hermaphrodite, usually subtended by a few long hyaline hairs. *Glumes* somewhat unequal, lower, 1-1.5 mm. long, upper 1.6-2.3 mm. long, boat-shaped, 1-nerved, densely scaberulous over the whole surface. Lemmas 2.2-2.7 mm. long, boatshaped, ovate in outline when flattened, acute, densely scaberulous over the whole surface, chartaceous 3-nerved, nerves slightly raised. *Paleas* subequal to the lemmas, firm, chartaceous, densely scaberulous except for the membranous obtuse apex. *Lodicules* truncate, cuneate, fleshy, 1-2 nerved. *Stamens* 3, anthers about 1.7 mm. long, cultrate in outline, reddish purple when mature. *Ovary* glabrous, styles free, stigmas plumose. *Grain* oblong-elliptic in outline, about 1 mm. long and 0.5 mm. wide, with a wide, shallow dorsal groove, reddish brown, opaque; hilum basal, punctiform; embryo slightly less than half the length of the grain, broadly obovate in outline.

The distribution of this species is mainly confined to the high mountain grassland of the eastern part of Southern Rhodesia and the more northerly parts of the Transvaal. According to verbal reports it is a feature of the grasslands in the eastern highlands of Southern Rhodesia from Inyanga south to Chipinga. All records seen fall within division E. of the Flora Zambesiaca. In the Transvaal it occurs sporadically on high mountains such as the Blouberg (Pietersburg distr.), Kranzberg (Waterberg distr.) and near to Graskop (Pilgrims Rest distr.) on the eastern Transvaal escarpment. Its southern limit seems to be a few isolated occurrences in the Rustenburg district at a much lower elevation than is usual for the species. In most of the Transvaal localities it seems to be very depauperate probably due to unsuitable conditions. The Graskop specimens are better developed however, and agree well with the Southern Rhodesian plants.

Eragrostis acraea is closely related to *E. grandis* Hilleb., a Hawaiian species, and in the past has been given this name erroneously. The spikelets of the Hawaiian species are, however, often many-flowered and the lemmas not as densely scaberulous while the keels of the paleae are covered with robust hyaline spines. Of the African species *E. sclerantha* resembles *E. acraea* but is not closely related to it.

Some records state that *E. acraea* remains green throughout the winter and is grazed by stock during this season. Most reports, however, state it to be of very little value and often a nuisance due to its occurrence in very large stands. The epithet "acraea" (dweller in high places) refers to the habitat preferences shown by this species.

Andropogon platybasis J. G. Anderson, sp. nov. *A. mannii* Hook f. affinis, sed flore superiore spicularum sessilium antheris ad staminodia minuta redactis, gluma inferiore spicularum pedicellatarum 7-9 nervata apice integra vel utrinque nervi breviter excurrentis lobis duobus membranaceis, spiculis pedicellatis masculinis differt.

Gramen perenne ad 75 cm. altum, rhizomate brevi, vaginis basalibus distincte flabellatis. *Culmi* erecti. *Folia* ad 15 cm. longa, 3-4 mm. lata, linearia, apice acuta. *Inflorescentia* 3 (interdum 2) racemis spiciformibus consista. *Spiculae sessiles* ad 6 mm. longae. *Glumae* subaequales; inferior 5-6 mm. longa, minute 2-dentata; superior ad 4 mm. longa, 3-nervata, nervo medio in aristam ad 1 mm. longa excurrenti. *Flos inferi*or ad lemma 4 mm. longum redactus. *Flos superior* femineus antheris ad staminodia minuta redactis. *Spiculae pedicellatae* masculinae ad 7 mm. longae. *Gluma inferior* nervo medio utrinque 3-4 nervis, apice integra vel utrinque nervi breviter excurrentis lobis duobus membranaceis. *Gluma superior* circiter 7 mm. longa, 3-nervata. *Flos inferior* ad lemma 6 mm. longum redactus. *Flos superior* masculinus; lemma et palea nulla.

TRANSVAAL—Lydenburg: 13.6 miles from Lydenburg on road to Sabie, *de Winter & Codd* 199. Belfast: 6 miles north-east of Dullstroom, c. 6,800 ft. *de Winter & Codd* 3225; 5½ miles from Dullstroom on road to Lydenburg, *de Winter & Codd* 180 (PRE, holo).

Perennial, up to 75 cm. tall, with a short rhizome, basal sheaths persistent, distinctly flabellate. *Culms* erect, simple, 2-3 noded, glabrous, striate, compressed; nodes glabrous; internodes glabrous and smooth except for the upper which is pilose for approximately 3 cm. below the inflorescence. *Leaves* up to 15 cm. long, 3-4 mm. wide, folded or flat in the upper half, linear with the apex acute, glabrous, occasionally with a few long hairs near the ligule, margins scaberulous; sheaths glabrous, striate, basil, strongly compressed and keeled, pallid or suffused with purple; ligule a fimbriate membrane up to 1 mm. long. *Inflorescence* of 3 (occasionally 2) spikelike racemes arranged digitately or subdigitately. *Racemes* 2-3 cm. long; spikelets greyish-violet, paired, lower sessile, upper pedicelled; pedicels 2-3 mm. long, linear, pilose on the margins. *Sessile spikelets* lanceolate, about 6 mm. long, *Glumes* sub-equal, membranous, glabrous; lower 5-6 mm. long, narrowly lanceolate, minutely 2-dentate, concave between the keels with 2 nerves in each keel, keels scaberulous from the middle upwards; upper about 4 mm. long, narrowly boat-shaped, 3-nerved with the faint lateral nerves often anastomosing with the distinct mid-nerve, mid-nerve excurrent into a 1 mm. long awn. *Lower floret* reduced to the lemma, about

4 mm. long, with inflexed margins, hyaline, nerveless, margins ciliate in the upper half. *Upper floret* female with the anthers reduced to tiny staminodes; lemma about 2 mm. long, lobed to about the middle, awned from between the lobes, awn up to 9 mm. long, lobes obscurely ciliate; palea truncate, hyaline, nerveless, approximately 0.75 mm. long. *Pedicelled spikelet* male, lanceolate, about 7 mm. long. *Glumes* membranous: lower with a mid-nerve and 3-4 nerves on either side, keeled with the keels scaberulous in the upper half, entire at the apex or with 2 membranous lobes on each side of the slightly excurrent nerve; upper narrowly boat-shaped, 7 mm. long, 3-nerved, membranous, apex mucronulate. *Lower floret* reduced to the lemma, lanceolate, about 6 mm. long, 3-nerved with a distinct mid-nerve and a faint lateral nerve on either side, apex obtuse. *Upper floret* male; lemma and palea absent. *Anthers* 3 mm. long.

Andropogon platybasis has so far been recorded only from the Belfast and Lydenburg districts of the Transvaal where it was found growing near streamlets in the mountains. It is closely allied to *Andropogon mannii* Hook. f. described from Fernando Po in Upper Guinea, which grows in a similar habitat. Our material was compared with *A. mannii* at Kew by Mr. B. de Winter and important differences were found.

In *A. platybasis* the lower glume of the pedicelled spikelet is 7-9 nerved and entire at the apex or with two membranous lobes on each side of the shortly excurrent nerve. In *A. mannii* the lower glume of the pedicelled spikelet has a prominent median nerve and two or three slender nerves close to the keel. The apex is distinctly trifid. Furthermore in *A. platybasis* the upper floret of the sessile spikelet is female with the anthers reduced to very tiny staminodes. In *A. mannii* the upper floret of the sessile spikelet is bisexual.

Tricholaena monachne (Trin.) Stapf et Hubbard var. **annua** J. G. Anderson, var. nov., a typo annua distincta, inflorescentia subtiliter divaricata, oblongo vel late ovata, ad statura plantae ampla, spiculis parvioribus constanter 1.5-2.3 mm. longis distinguitur.

SOUTH WEST AFRICA.—Kaokoveld Reserve: 35.5 miles west of Otihu on road to Orupembe, *de Winter* and *Leistner* 5704; 12 miles north-west of Sesfontein, *de Winter* and *Leistner* 5873. Omaruru: Brandberge, May, 1936, Boss s.n. Outjo: Farm Sebra, 45.6 miles south of Kamanjab, *de Winter* 3116. Otjiwarongo: Waterberg, Quickborn, *Bradfield* 638. Swakopmund: Sphinxflache, *Boss* 8; Granite hills 24 miles west of Usakos on main road to Swakopmund, *Giess* 3007; Spizkopje, January, 1937, *Boss* s.n.; 50.5 miles east of Swakopmund on road to Usakos, *de Winter* 3205 (PRE, holo.).

This plant has so far been recorded only from the north-western portion of South-West Africa where it usually grows on sandy soils, often near or on granite hills. In contrast to typical *T. monachne* it is

an annual plant up to 60 cm. tall with a much softer, almost delicate appearance. The inflorescence is finely divaricate, oblong or broadly ovate in form and is large in relation to the rest of the plant. The spikelets are usually reddish or purple in colour and are 1.5-2.3 mm. long whereas they are 2.1-3.0 mm. long in typical *T. monachne*.

Brachiaria dura Stapf var. **pilosa** J. G. Anderson var. nov.: a type planta robustiore ad 1.07 m. alto, racemis, spiciformibus 2 interdum 1 raro 3, glumis et lemmatibus floris inferioris dense pilosis, gluma inferiore 3-6 nervata, superiore 5-9 nervata, lemmata floris inferioris 5-7 nervato distinguitur.

CAPE PROVINCE.—Hay district: Witsand, common on yellow dunes, *Ferrar* 20; ½ mile west of Doornaar homestead, white sand-dunes, c. 4,000 ft., *Leistner* 1372; sand-dunes at Witsand, *Acocks* 2168; foot of dunes, *Esterhuysen* 2269 (PRE, holo.).

This variety is locally abundant in the Witsand area of the Hay district and is described as being one of the characteristic plants on and at the foot of white sand-dunes. These dunes form an inclave in a vastly larger area of red dunes. It is easily distinguished from typical *B. dura* in that it is generally a more robust plant, up to 3½ ft. tall, with the inflorescence consisting of 2, occasionally 1, rarely 3, spikelike racemes. The glumes and the lemma of the lower floret are densely pilose. The nervation of the glumes and lemma of the lower floret varies considerably. In the specimens examined it was found that in *Leistner* 1372 the lower glume is 3-nerved with the upper glume and lemma of the lower floret 5-nerved whereas in *Esterhuysen* 2269 the lower glume is 6-nerved, the upper 5-nerved and the lemma of the lower floret 7-nerved. In typical *B. dura* the lower glume is usually 4-nerved and the upper glume and lemma of the lower floret 5-nerved.

ASCLEPIADACEAE

Schizoglossum montanum R. A. Dyer, sp. nova distinctissima, nullis e specibus notis propinqua.

Herba perennis parva, e basi ramis unis vel paucis procumbenti-decumbentibus ortis; rami 5-12 cm. longi, tomentulosi, linea longitudini angusta glabra, internodiis 3-5. *Folia* ovata, late ovata vel ovato-elliptica, basi obtusa vel subcordata, 7-14 mm. longa, 5-9 mm. lata, glabra vel margine et costa subtus pilis paucis indutis; petiolus brevis, 2-4 mm. longus, glaber vel tomentulosus. *Umbellae* 1-2, laterales, pedunculatae, 3-5-florae; pedunculus 2-3 mm. longus, tomentulosus; bracteae subulatae, 1-2 mm. longae; pedicelli 5-10 mm. longi, tomentulosi. *Sepala* apice purpurata, oblongo-lanceolata, 3 mm. longa, 1.25 mm. lata, dorso tomentulosa. *Corolla* languido-flava, basi breviter connata; segmentae ovato-ellipticae, 5 mm. longae, 2.5 mm. latae, marginibus maturitate leviter recurvatis, apiculatae glabrae. *Corona* e basi corollae orta; lobi 5, interdum basi dente minuto alternati, subquadrati, 1.5 mm. alti, 1.25 mm. lati, 0.75 mm. crassi, dorso margine

superiore dentato, alte appendice centrali una circ. 0.5 mm. longa raro absenti et intus margine superiore appendicibus similibus duabus columna staminum incumbentis praeditis. *Pollinia* nonnihil clavata, caudiculis longiores.

NATAL.—Bergville Distr.: Mont aux Sources, *Schweickerdt* in PRE 28903; Cathedral Peak Forest Station, on ridge leading to Organ Pipe Pass, 9,000 ft., *Killick* 1838; at 7,300 ft., *Killick* 2285 (K; PRE, holo.).

Small perennial herb with 1- several procumbent-decumbent branches from the base; branches 5-12 cm. long. tomentulose with narrow glabrous longitudinal strip, 3-5 internodes. *Leaves* broadly ovate, ovate, or ovate-elliptic, obtuse or sucordate at the bass, 7-14 mm. long, 5-9 mm. broad, glabrous or with few hairs on margin and on midrib below, shortly petiolate; petiole 2-4 mm. long, glabrous or timentulosa. *Umbels* 1-2 from a stem, lateral, pedunculate, 3.5-flowered; peduncle 2-3 cm. long tomentulose; bracts subulate 1-2 mm. long; pedicels 5-10 mm. long; tomentulose. *Sepals* purple-tipped, oblong-lanceolate, 3 mm. long, 1.25 mm. broad, tomentulose on back. *Corolla* dull yellow, shortly united at base; segments ovate-elliptic, 5 mm. long, 2.5 mm. broad, margins slightly recurved with age, apiculate, glabrous. *Corona* arising from base of corolla; lobes 5, subquadrate, sometimes with a minute tooth between at the base, 1.5 mm. high, 1.25 mm. broad, 0.75 mm. thick, with a toothed ridge across the upper margin of the back, with 1 central appendage about 0.5 mm. long from the top, rarely absent, and with 2 similar appendages from the top of the inner margin incumbent on the staminal column, extending into minute short ribs down the inner face. *Pollen masses* somewhat club-shaped and longer than the caudicles.

Professor H. G. Schweickerdt collected this dwarf perennial in flower in November, 1929, at Mont Aux Sources near the cave beyond the Sentinel, where it was common on grassy slopes. Mr. D. J. B. Killick made his collections in December, 1952 and 1957 during a botanical survey of the region. Although the species is common locally, it has not yet been recorded further afield.

SCROPHULARIACEAE

Zaluzianskya pulvinata Killick, sp. nova distincta, nulla affinitate intima manifesta.

Planta parva, perennis, pulvinata, circiter 3 cm. alta. *Folia basalia* rosulata, sessilia, lanceolata, 1.5-2.5 cm. longa, 2-5 mm. lata, apice obtuso-rotundata, basi cuneata plerumque integra, carnosa, glabra vel marginibus pilosis. *Pedunculi* in rosulis, solitarii, 2-8 cm. longi, pilosi; bracteae lanceolato-ellipticae, 1.5-2 cm. longae, 5-7 mm. latae, apice obtusae vel acuminatae, integrae vel prope apicem paucidentatae, margine et costa pilosis; spicae terminales. *Calyx* ovoideo-tubulosus,

1.1 cm. longus, prominenter 5-costatus, breviter bilabiatus, costis et marginibus dentorum ciliatis, lobo antico 2-dentato, postico 3-dentato, dentibus subulatis, 1.5-2 mm. longis. *Corolla* tubulosa, extus sanguinea, intus alba, tubo 3.5-6 cm. longo, lobis obovatis bifidis 5-7 mm. longis. *Stamina* 4, didynama, 2 anticis breviter exsertis antheris 2.5 mm. longis, 2 posticis inclusis antheris 3.5-4 mm. longis. *Stylus* filiformis exsertus.

NATAL.—Bergville District: Frequent in *Rendlia nelsonii* Grassveld on stony ridge of spur in Catchment 2, 7,100 feet, Cathedral Peak Forest Station, *Killick* 1584; locally common on rock outcrop between Sentinel Gate and base of Sentinel cliffs, c. 9,000 feet, *Killick & Marais* 2204 (PRE, holo.).

Small perennial cushion-plant about 3 cm. high consisting of 3-10 closely aggregated rosettes. *Basal leaves* rosulate, sessile, lanceolate, 1.5-2.5 cm. long, 2-5 mm. wide, apex obtuse-round, base cuneate, usually entire, succulent, glabrous or margins sometimes pilose. *Peduncles* 1 per rosette, 2-8 cm. long, pilose; leaves similar to basal leaves but margins occasionally toothed near apex and midrib pilose; bracts lanceolate-elliptic, 1.5-2 cm. long, 5-7 mm. wide, apex obtuse or acuminate, entire or few-toothed near apex, margins and midrib pilose; spikes terminal. *Calyx* ovoid-tubular, 1.1 cm. long, prominently 5-ribbed, shortly bilabiate, ribs and margins of teeth ciliate; anterior lobe 2-dentate, posterior lobe 3-dentate; teeth subulate 1.5-2 mm. long. *Corolla* crimson outside, white inside, glandular-puberulous; tube slender, 3.5-6 cm. long, glabrous within except for ring of stiff hairs at top of throat; lobes 5, obovate, bifid to about half way, 5-7 mm. long; lobules spathulate, diverging, occasionally 2-cleft. *Stamens* 4, didynamous; 2 anterior slightly exserted, anthers 2.5 mm. long, horizontal; 2 posterior slightly included, anthers 3.5-4 mm. long, vertical *Style* filiform, exserted beyond anthers.

This small cushion plant grows in rocky situations between 7,000 and 10,000 feet in the Drakensberg. Though it has only been collected on the Natal side of the escarpment it has been seen by the author on the summit and in Basutoland. A specimen without flowers in the National Herbarium, *Galpin* 6797 from Ben McDhui in the Eastern Cape, may also be *Z. pulvinata.* It differs from typical *Z. pulvinata* in that the leaves are more acute at the apex and do not appear to be fleshy.

Z. pulvinata is a distinct species without any obviously close ally. Its nearest affinity is possibly with the extremely variable *Z. maritima* Walp. which, however, has quite a different habit

PEDALIACEAE

Rogeria petrophila de Winter, sp. nov., *R. bigibbosae* Engl. affinis, sed caulibus procumbentibus mollibus, fructibus parvioribus, loculis duobus chartaceis non ligneis differt.

Herba perennis, mollis, glandulosa, saepius caulibus procumbentibus 10-20 cm. longis. *Folia* opposita, cordata, margine grosse dentato, petiolis 2-6 cm. longis. *Flores* extus cremei vel lutei, intus purpurati. *Calyx* parvus, 5-partitus, lobis circiter 2 mm. longis. *Corolla* 4-6 cm. longa, tubulosa, lobis 5 inaequalibus late ovatis. *Ovarium* in parte superiore glandulosum, inferiore glabrum, 2-loculare. *Stamina* 4; staminodium 1; filamenta ad basin corollae affixa; antherae divergentes dorsifixae. *Capsula* 2-2.5 cm. longa, laterale compressa, chartacea, loculicide ab apice fere ad basin dehiscens. *Semina* circiter 2 mm. longa, anguste oblonga, minute punctata.

Simple or branched, soft, often trailing herb. *Branches* usually simple 10-20 cm. long, all parts covered with mucilage glands. *Leaves* opposite, up to 4 cm. long and 5 cm. wide, cordate in outline, deeply and coarsely dentate, greyish green; petioles 2-6 cm. long; margins often sparsely furnished with short crisped hairs. Nectaries present at the base of the petioles and pedicles. *Flowers* clustered in the axils of the leaves and developing successively, cream to pale yellow outside, tinged with purple within the tube and throat. Pedicel 1.2 mm. long. *Calyx* slightly zygomorphic, small, persistent, 5-partite, tube very short; lobes elongate-triangular, about 2 mm. long, fringed with short crisped glandular hairs. *Corolla* very variable in length, 4-6 cm. long, slightly gibbous at the base, sparsely dotted with mucilage glands outside otherwise glabrous; limb somewhat two-lipped, lobes 5, broadly ovate, the lower slightly larger than the others. *Stamens* 4, with a short staminode between the pairs, inserted on the lower part of the corolla tube, filaments pilose at the base, glabrous upwards except for sparsely scattered stalked glands, slightly flattened filiform, long; anthers 2-celled, dorsifixed, cells divergent, pendulous, obliquely ovate in outline; disc inconspicuous. *Ovary* slightly asymetrically elongate-conical, lower ¼ glabrous and smooth, upper part densely covered with grey mucilage glands, 2-celled with placentae axillary and projecting into the cells with the ovules 3-5 seriate; spurious partitions poorly developed and only at the base of the ovary. *Capsules* 2-2.5 cm. long, lanceolate in side view, very slightly gibbous at the base, gradually tapering into a curved apex, laterally flattened, dehiscing loculicidally almost to the base, valves 2, chartaceous. *Seeds* about 2 mm. long, narrowly oblong brown finely punctate, containing large amounts of an oily substance.

SOUTH WEST AFRICA.—Kaokoveld: 30 m. S. of Kunene River on rd. to Orupembe, *de Winter & Leistner* (K; M; PRE, holo; SRGH). Windhoek: about 9 m. up the Kapupa River south of Otjihipa Mountain Summit, *Davies, Thompson & Miller* 62.

This interesting plant is the only soft, trailing species of *Rogeria* so far discovered. Its habitat is also not typical for the rest of the genus. Other species are usually tall, erect plants growing at the foot of, or on rocky hillocks, as well as in disturbed soil on roadsides and in gullies. *R. petrophila,* however, is completely adapted to growing in narrow rock fissures where practically no soil is present and frequently hangs

from cliff faces where it is rooted in crevices so narrow that a knife blade cannot be inserted into them. Its known distribution is limited to the red granite mountains of the northern Kaokoveld where the rainfall seldom exceeds 4-6 inches. Although it favours sheltered overhanging cliffs and gullies, it seems strange that a plant of such a mesophytic appearance can exist under these conditions. However, heavy dews are experienced in these areas during summer and sea mists are occasionally blown inland for sixty miles or more. This moisture after condensation on the rock surfaces may seep into the fissures. Thus the water supply available to these plants may be more copious and replenishment more frequent than is apparent at first sight.

One of the plants collected had a number of very fine filiform branches bearing tiny leaves and fruits, additional to the much thicker stems and larger leaves and fruits usually found. These fruits which are about 6 mm. long and ovate in shape would at first sight not be recognised as belonging to the same plant, but contain fully formed seeds. This condition was found in only one plant and it is uncertain whether this is an abnormal growth or an indication of a facultative dimorphism of the fruits.

The seeds, contain a very high proportion of thin oil and probably about 30 per cent. of their weight is made up by this substance.

RUBIACEAE

Canthium locuples (K. Schum.) L. E. Codd, comb. nov.

Plectronia locuples K. Schum. in Engl., Bot. Jahrb. **28**:75 (1899). Type: Delagoa Bay, *Monteiro* 52 (K, iso.).

P. fragrantissima K.Schum., l.c., Type: Lourenço Marques *Schlechter* 11635 (K; PRE, iso.).

Bullock in Kew Bull. 353 (1932) states the grounds for using the generic name *Canthium* Lam. instead of *Plectronia* Linn. and makes the necessary combinations in *Canthium* for tropical African species. The reasoning advanced in favour of *Canthium* is generally accepted and, in order to bring uniformity to the species in Southern Africa, the above combination is now published.

C. locuples resembles the narrower-leaved specimens of *C. obovatum* Klotzsch, but can be separated by the smaller corolla with long, slender styles and small stigmas, the smaller, more open inflorescences with slender, puberulous pedicels, and the smaller fruits. I am indebted to Mr. W. Marais for examining the isotype of *Monteiro* 52 at Kew and matching it with the more modern specimens, *Medley Wood* 1020 and *Gerstner* 4984.

An isotype of *P. fragrantissima* K. Schum. is present in the National Herbarium, Pretoria. It has small obovate leaves rounded at the apex and relatively long primary peduncles. One of our specimens matches it

very well, namely, *Gerstner* 4811 from False Bay, Hlabisa District. However, the resemblance to the material cited below as *C. locuples* is very close and it is preferred, at this stage in our knowledge, not to maintain it as distinct.

C. locuples has been recorded from Mozambique, eastern Transvaal, Swaziland and Zululand, and the following specimens are in the National Herbarium, Pretoria.

MOZAMBIQUE. Sul do Save: *Pedro and Pedrógao* 1474. Lourenço Marques: *Sim* 20908; *Borle* 165; 191. Inhaca Island: *Mogg* 27001; 27139. Maputo: *Hornby* 2546.

TRANSVAAL.—Sibasa: Kruger National Park, Punda Milia, *van der Schijff* 1429. Nelspruit: Kruger National Park, Bukwenene, *van der Schijff* 2127; Hippo Pool, *van der Schijff* 4157; Klokwene, *van der Schijff and Marais* 3725.

SWAZILAND.—Stegi, *Gerstner* 4064.

NATAL.—Zululand, *Gerstner*, 4984. Hlabisa: False Bay, *Gerstner* 4744; Dukuduku Forest, *Gerstner* 5232; Hluhluwe Game Reserve, *Ward* 2937. Mapumula: *Edwards* 1718; 1781. Camperdown: Nagle Dam, *Wells* 1372. Inanda: Umzinyati, *Medley Wood* 11570.

Canthium wildii (Suesseng.) L. E. Codd, comb, nov.

Plectronia wildii Suesseng. in Trans. Rhod. Sci. Assoc. **43**:133 (1951). Type: Southern Rhodesia, Marandellas, *Dehn* 590.

Although closely allied to *C. huillense* Hiern, this species can be distinguished by the uniform, dense tomentum on both surfaces of the leaves.

Canthium gilfillanii (N.E. Br.) [N.E. Br. ex] O. B. Miller in Journ. S.Afr. Bot. **18**:82 (1952), based on *Plectronia gilfillani* N.E. Br. in Kew Bull.: 105 (1906). Type: near Johannesburg, on Jeppes Town Ridge, *Gilfillan* in Herb. Galpin 6010 (PRE, iso.).

Attention is drawn to the publication of this combination which is liable to be overlooked by compilers of indexes, because it is included in a long list of trees and shrubs recorded from the Bechuanaland Protectorate. The combination was no doubt unintentionally effected, but it complies with the requirements of the rules. Unless an earlier valid combination is found, the above is the correct citation to use.

C. gilfillanii is a clear-cut species with velvety-tomentose leaves. It is a characteristic species of rocky places in the Pretoria-Witwatersrand areas and extends to the Bechuanaland Protectorate and northern Natal. For some time the need for the combination has been felt and this has resulted in the method of listing the name adopted by O. B. Miller.

Xeromphis rudis (E. Mey. ex Harv.) L. E. Codd, comb. nov.

Randia rudis E. Mey. ex Harv., Thes. Cap. **1**:22, t. 34 (1959); Sond. in Fl. Cap. **3**:7 (1864); Sim, For. Fl. Cape Col. 236, t. 84 (1907). Syntypes: Eastern Cape Province,*Drege; Ecklon* and *Zeyher;* Natal, *Gueinzius; Krauss.*—var. *parvifolia* Sond., l.c. *R. parvifolia* Harv., l.c. 23, t. 35 (1859), non Lam., Encyc. **3**:25 (1789). Type: Port Natal, *Sanderson* s.n.

Gardenia microcarpa Hochst. in Flora, **25**:237 (1842), non Bartl. ex DC., Prodr. **4**:384 (1830).

Lachnosiphonium rude (E. Mey. ex Harv.) Garcia in Junta Inv. Ultramar, Mem. Bot. **4**:31 (1958).—var. *parvifolium* (Sond.) Garcia, l.c.

Keay in Bull. Jard. Bot. Brux. **28**:37 (1958) separates *Xeromphis* Raf. from *Randia* L. and places *Lachnosiphonium* Hochst. as a synonym of the former. He dealt mainly with tropical species and made the following combinations: *X. spinosa* (Thunb.) Keay, *X. obovata* (Hochst.) Keay and *X. nilotica* (Stapf) Keay. Judging by the characters which he lists for separating the two genera, it appears that the South African species *R. rudis* should be transferred to *Xeromphis,* and the combination is now made.

Harvey separated *R. parvifolia* from *R. rudis* on the grounds of the pubescent calyx and leaves, but there is a complete range of intermediates which indicate that the pubescent form is not worth separating even as a variety. For the same reason it has not been possible to find good grounds for separating *R. vestita* S. Moore (=*R. taylori* S. Moore) from *X. obovata* (Hochst.) Keay. The leaves of *R. vestita* are more densely clothed with strigose hairs and are, in general, narrower than those of *X. obovata,* but the presence of intermediates leads to difficulty in separating them satisfactorily, although extreme forms look quite distinct.

COMPOSITAE

Euryops acraeus M. D. Henderson, sp. nov., *E. evansii* Schlechter affinis, statura minore foliis multo minoribus facile distinguitur.

Frutex ad 60 cm. altus, ramosus. *Ramuli* apice foliis rosulatis dense induti, basi subnigri defoliati foliorum reliquiis asperi. *Folia* amplexicaulia erecta, 1.5 cm. longa, 2 mm. lata, coriacea, revoluta, apice breviter 3-lobata, *Capitula* axillaria, campanulata, pedunculis 2.5 cm. longis. *Involucri bracteae* 6.5 mm. longae, basi 3 mm. connatae. *Receptaculum* leviter convexum, alveolatum. *Flores* radii 11. *Achaenia* dense albolanata. *Pappi setae* copiosae, caducae, sinuosae. *Flores* disci 37; corolla 3.5-4 mm. longa, parte superiore ampliata 2 mm. longa globosa. *Achaenia* albolanata. *Pappi setae* copiosae, multi-seriatae, caducae, sinuosae.

BASUTOLAND.—Cleft Peak Area at 9,800 ft., Dec., *Killick* and *Marais* 2176 (PRE, holo.).

Dwarf shrub up to 60 cm. high, branched. Apex of branches densely covered with rosettes of leaves, basal part defoliate, blackish terete, up to 5 mm. diam., rough with remains of leaves. *Leaves* erect, becoming reflexed with age, oblong, 1.5 cm. long, 2 mm. broad, not narrowed to the base, stem clasping, coriaceous, margins revolute, prominently 3-5 veined below, apex shortly 3-lobed, lobes 1 mm. long. *Capitula* on 2.5 cm. long, slender peduncles, axillary, campanulate 2-2.5 cm. diameter with rays, disc 1 cm. diameter. *Involucral bracts* 6.5 mm. long, lower 3 mm. joined, lobes 9, ovate, obtuse, 3 mm. wide at base, conspicuously veined. *Receptacle* 4 mm. diameter slightly convex, honeycombed with margins of pits produced 0.5 mm. *Ray florets* 11, corolla 1 cm. long, limb 8.5 cm. long 4 mm. broad. *Achene* 1.25 mm. long, 0.5 mm. broad, densely white woolly. *Pappus* in several rows, caducous, very bristly 1.5 mm. long, curly. *Disc florets* 37, corolla 3.5-4 mm. long, basal 1.5 mm. narrow cylindric, upper part inflated, globose, 5 lobed, lobes .75 mm. long, acute. *Anthers* narrowed between the ovate appendage and pollen-bearing parts. *Achenes* 2 mm. long, .75 broad, not so woolly as those of the ray florets. *Pappus* in several rows, caducous, very bristly, 1.5-2 mm. long, curly.

The type material is the only collection of this distinctive species. It was collected on the summit of the Drakensberg, in the Cleft Peak Area, hence the specific name which means "a dweller on the heights." The habit is similar to that of *E. montanus* Schlechter, but the heads are much larger, and are borne on long peduncles, and the leaves are longer. Although one would not confuse the two species, the closest affinity appears to be *E. evansii* Schlechter, which is to be found in the same region. At Kew there is a specimen of unknown origin cultivated in England by R. B. Purves which was determined as *E. evansii* Schlechter. It is certainly not this species, but closely resembles *E. acraeus*. Possibly this is a case similar to that of *Helichrysum milfordiae* Killick which was cultivated in Europe under an incorrect name for fifty years before a specimen was made from the wild. In the case of the *Euryops*, climate or cultivation will have had to show their effect on the leaves and the bark, but when one considers the very different conditions it had to endure, this is not an impossibility.

The East African species, *E. brownei* S. Moore is near *E. acraeus*, but the leaves are entire and the peduncles tomentose.

Euryops brevipapposus M. D. Henderson, sp. nov., *E. floribundo* N.E.Br. affinis sed capitulis campanulatis haud hemisphericis, floribus discii paucioribus, pappo multo breviore et haud supra ovarium reflexo differt.

Frutex glaber, ramosus, 60-90 cm. altus, caulibus ramis asperis, ad apices dense foliatis. *Folia* linearia, planta, integra, erecta, maturitate reflexa. *Pedunculi* 2-6 cm. longi, ad apices ramorum axillares plus minusve corymbosi. *Capitula* radiata, floribus flavis. *Involucrum* campanulatum, 3-5.5 mm. longum, apice 4-8 mm. latum, bracteis imbricatis basi, 1-2 mm. connatis. *Receptaculum* planum vel leviter convexum.

Flores radii 5-8, corollae limbo 5-8 mm. longo oblongo vel elliptico. *Flores* discii minus 30, corolla in parte superiore abrupte inflata, ovario oblongo pilis densis albidis appressis, pappo caduco setis numerosis scabridis 0.5-1 mm. interdum 1.5 mm. longis.

TRANSVAAL.—Louis Trichardt: *Prosser* 2023; Blaauwberg, *Smuts & Pole Evans* 885; Sekukuniland *Mogg* 16960.

NATAL.—Zululand *Gerstner* 5131; Krantzkop, *Codd & Dyer* 2810, *Edwards* 815; Pietermaritzburg, rock crevice near w. edge of Table Mountain, 3,000 ft., *Killick* 464 (PRE, holo.). Camperdown, *Wells* 1616; Alexandra, *Rudadis* 449 Orbi Flats, *McClean* 560.

CAPE.—Stutterheim, *Acocks* 9578; East London, *Galpin* 5667; Albany, *Britten* 1497; *Story* 2279; Port Alfred, *Tyson* s.n.; *Salisbury* 25; Port Elizabeth, *Long* 1217.

A glabrous branched shrub 60-90 cm. high, branches woody, rough with the remains of leaf bases, brownish to blackish. *Leaves* dense towards the ends of the branches, erect, usually reflexing in age, linear flat, entire, acute, not narrowed, more or less clasping at the base, 2-9 cm. long 1-2.5 mm. broad. *Peduncles* axillary towards apex of branches, corymbose or more or less racemose. *Capitula* radiate, florets yellow. *Involucre* campanulate 3-5.5 mm. long, 4-8 mm. wide at the top, bracts 7-10 joined for 1-2 mm. at the base, imbricate, narrow membranous margins, tips ciliate. *Receptacle* flat or slightly convex, honeycombed with margins of pits produced to enclose base of ovaries. *Ray florets* 5-8 corolla limb oblong to elliptic, 5-8 mm. long, 2-3 mm. broad, tube 1-1.5 mm. long, slender; style branches flat, obtuse; ovary more or less oblong, 1-2 mm. long, densely covered with adpressed white hairs with depressed white hairs about .5 mm. long; pappus caducous, of numerous, straight scabrid bristles, .5-1 (occasionally 1.5) mm. long. *Disc florets* less than 30, corolla 3-4 mm. long, abruptly inflated for top 2.5-3 mm, lower part slender, lobes 1 mm. long, reflexed at maturity; stamens inserted at base of inflated part; style-branches truncate; ovary oblong, 1-2 mm long, densely covered with adpressed white hairs, about .5 mm. long; pappus caducous, of numerous, straight scabrid bristles .5-1 (occasionally 1.5) mm. long.

Schlechter was the first to recognize that a new species was involved among these specimens, and proposed the name *Euryops natalensis* for *Rudatis* 499. This name was never published and because *E. brevipapposus* is now known to occur in the Transvaal and eastern Cape in addition to Natal, it seemed better not to adopt Schlechter's name. The pappus bristles are shorter than those of any related species, so the specific name chosen was thought to be more appropriate.

The specimens quoted above are all in the National Herbarium, Pretoria, where they have been named *E. floribundus* N.E. Br., *E. tenuissimus* (L.f.) Less, or left with no specific epithet. *Wells* 1616 was sent to Kew, but the liaison officer there was unable to match it. He suggested that the nearest ally was *E. annae* Phillips, because it has the

campanulate capitula in common, but the connection seems to be rather with *E. floribundus,* whose habit is very similar but which has hemispherical capitula. Separation from *E. tenuissimus* is easy on account of the large hemispherical capitula with numerous involucral bracts and disc florets and more or less terete leaves of *E. tenuissimus.* The distribution of the two species meet in the area between Uitenhage and Port Elizabeth, that of *E. tenuissimus* stretching West as far as Namaqualand, while that of *E. brevipapposus* stretches east through Natal to the Eastern Transvaal. *E. floribundus* has a far more restricted distribution in the eastern Cape, being most plentiful in the area surrounding Queenstown.

The length and breadth of the leaves of *E. brevipapposus* is very variable, but they are always linear, slightly stem clasping and flat. Some of the eastern Cape specimens have more, narrower involucral bracts and slightly longer pappus bristles than those from Natal but they fit into this species better than into *E. floribundus* on account of the shape of the capitula.

It appears, from the notes written by collectors on the specimens in PRE. that *E. brevipapposus* is found almost exclusively in scrub or open forest on mountains or the edges of krantzes. Golden yellow capitula are borne throughout the summer, from September to May, and the shrubs seem to be evergreen.

Helichrysum pagophilum M. D. Henderson, sp. nov., *H. sutherlandii* Harv. affine, sed ita differt: habitus compactior, folia congesta rosulata basi latioribus, capitula solitaria sessilia, involucri bracteae luteae.

Frutex ligneus, perennis, pulvinatus, 6.7 cm. altus ad 60 cm. diam. *Ramuli* numerosi reliquiis foliorum senectorum suffuscorum glabrorum obtecti. *Folia* ad apices ramulorum dense rosulata, late ovata, haud ad basin attenuata, utrinque dense lanata. *Capitula* 7-10 mm. diam., terminalia, solitaria, sessilia. *Involucri bracteae* luteae. *Receptaculum* planum, leve. *Flores* 27, hermaphroditi. *Achaenia* setosa, haud striata. *Pappi setae* uniseriatae, graciles, liberae.

BASUTOLAND.—Summit Drakensberg, Cleft Peak Area, 9,800 ft. Dec., *Killick & Marais* 2177 (PRE, holo). Mokhotlong Distr., summit Thabana Ntlenyana, 11,425 ft. Jan., *Guillarmod* 2336, *Coetzee* 605.

Woody perennials, forming compact cushions 6-7 cm. high, up to 60 cm. diameter, branches numerous arising at ground level, lower part covered with dried brownish leaves, upper part bearing dense rosettes of leaves. *Leaves* broadly ovate 5 mm. by 4 mm., not narrowed to the base, coriaceous, 5-nerved, nerves visible only on older glabrous leaves, young leaves densely covered on both surfaces with matted, greenish-grey wool. *Capitula* 7-10 mm. diam, solitary, sessile surrounded by rosettes of leaves. Involucral bracts yellow in several rows, inner spreading at the apex, glabrous, oblong to elliptic, obtuse, inner 5 mm. by

2 mm, outer shorter. *Receptacle* flat, smooth 1.5 mm. diam. *Florets* c. 27, all hermaphrodite, corolla 3 mm. long, slightly widened towards the apex, 5 lobed, lobes tuberculate outside 0.5-1 mm. long, less than 0.5 mm. broad. *Anthers* 1.5 mm. long, tails 0.5 mm., appendix 0.25 mm. *Achenes* setse, not striate, 1 mm. long. *Pappus* uniseriate, bristles slender, free, 3 mm. long, setose with looped hairs at the apex.

This small, compact plant has no really close affinities among the South African *Helichrysum* spp. and *Killick & Marais* 2177 was reported to be unique in the Herbarium at Kew. Superficially one would place it nearest *H. sessile* DC. (the type of which Moeser (Engl. Bot. Jahrb. **44**)), does not appear to have seen. The material called *H. sessile* DC. in South African herbaria, is from comparison with a photograph of the type, correctly named, but the specimens quoted by Moeser probably belong to *H. ernestianum* DC. of which he also did not see the type. *H. ernestianum* has several capitula borne on a scape While those of *H. sessile* are sessile at the ends of leafly branches.) *H. sessile*, like *H. pagophilum* is a low, cushion-shaped plant inhabiting high altitudes but closer examination reveals the following differences: *H. pagophilum* has densely woolly leaves, almost as broad as long, in this respect resembling *H. haygarthii* Bolus, there are less florets in each capitulum than in *H. sessile* and the achenes are setose not papillate nor becoming mucilaginous when wet. The capitula are very like those of *H. sutherlandii* Harv., especially in the compact forms of this species which are found on the Drakensberg and in Basutoland, but here the capitula are in pedunculate inflorescences. All these related species have white or pink involucral bracts, among the species with yellow involucral bracts there is no affinity of *H. pagophilum*.

Killick and Marais collected the first material for the National Herbarium in 1953 on the summit of the Drakensberg in the Cleft Peak Area, where it grew in limited quantities on rock faces. Subsequently it was found by Guillarmod and Coetzee in a small area on the top of Thabana Ntlenyana. The specific name meaning a lover of peaks, was chosen on account of the known collections.

Macowania corymbosa M. D. Henderson, sp. nov., *M. revolutae* Oliv. affinis, sed ita differt: capitula dense corymbosa, flores radii steriles, styli rami florum radii profunde divisi truncati, achaenia glabra.

Frutex ad 120 cm. altus, caulibus ramis dense glandulosis setosis infra folia foliorum reliquiis vestitis. *Folia* in parte superiore ramorum congesta, linearia, sessilia, marginibus revolutis, superne glandulis patentibus stipitatis vestitis, subtus lanatis, costa centrali glanduloso-setosa. *Capitula* sessilia in corymbis densis terminalibus disposita. turbinata. *Involucri bracteae* imbricatae, glanduloso-setosae, dorsaliter lanatae, marginibus membranaceis brunneis. *Flores radii* steriles, styli rudimento in tubo corollae incluso, ovarii rudimento, pappo caduco. *Flores discii* fertiles, corolla in parte superiore inflata, stylo profunde diviso truncato pilis apicalibus in centro longioribus; achaenia stricta, glabra, apice rostro brevi robusto; pappus caducus, setis non aequilongis ad basin partis corollae inflatia attingentis.

NATAL.—Bergville, Umlambonja River, July, 1936, *Marriott* in PRE. 22503 (PRE, holo.); *Esterhuysen* 12902; upper reaches of Indumeni River, Feb., *Killick* 1681; upper Sinyati River valley, July, *Edwards* 847; Cathedral Peak area, river bank and steep slopes, July *Esterhuysen* 10216; old rocky river bed July, *Esterhuysen* 12494.

Shrub up to 120 cm. high, stems and branches greyish-brown densely glandular-setose, striate, rough with the remains of leaf bases. *Leaves* dense at the ends of the branches, sessile linear, 3.5-4 cm. long, 1.5-2 mm. broad, margins revolute, midrib prominent below, upper surface densely glandular setose, under surface lanate with long, white curly hairs, glandular-setose on the midrib, apex shortly apiculate *Capitula* arranged in dense terminal corymbs, sessile, turbinate 1-1.5 cm. long, 1 cm. broad at the top. *Involucral bracts* imbricate, in about 6 rows, outer row ovate 3.5 mm. by 1.5 mm. innermost linear, 1 cm. by 1.5 mm. all glandular setose and lanate on the back, greenish with dark brown membranous margins. *Receptacle* 3 mm. diam. slightly convex, honeycombed with the margins of the pits shortly produced. *Ray florets* sterile, corolla 1.25 cm. long, tube very slender, pubescent, 6.5 mm. long, limb oblong 1.5 mm. broad, three-dentate at the apex; *style* rudimentary, enclosed in the corolla tube; *ovary* rudimentary, less than 1 mm. long; *pappus* caducous, bristles 1.25-4 mm. long. *Disc florets* fertile, corolla 6.5 mm. long, lower 3.5 mm. slender, pubescent, upper part inflated, lobes 1 mm. long with thickened tips; *style* deeply divided, branches more or less truncate with apical hairs longest in the centre; *achene* 3 mm. long, oblong, striate, glabrous crowned with a short, thick beak enclosed in the corolla tube; *pappus* caducous of slender setose bristles 1.25-4 mm. long.

In Journ. S.Afr. Bot. **16** (1950) Dr. Phillips put the genus *Homochaete* into synonomy under *Macowania* saying that he found it impossible to keep the two genera apart. Although there is no doubt that this conclusion is correct, he was under the impression that the specimens included in *M. corymbosa* were actually *Homochaete conferta* Benth. (Hook., Ic. Pl.: t. 1110). Examination of a capitulum from the holotype of this species, kindly presented to the National Herbarium by Kew, proved that this was not the case. The following differences were noticed: the leaves below the capitulum are shorter, broader and glandular-setose on both surfaces, the involucral bracts are nearly glabrous except for a few long hairs at the apices, the ray florets are fertile, the achenes are pubescent with no beak, and are crowned by the persistent pappus, and the style branches are obtuse with no long apical hairs. In the illustration of *H. conferta* the capitula are solitary. None of these characters prevents *H. conferta* from becoming *Macowania conferta* (Benth.) Phill. This opinion was confirmed by Mr. Marais at Kew.

Besides the fragment of the type collected by Dr. Sutherland in 1864 in Faku's territory, now Pondoland, there is no record of *M. conferta* in the National Herbarium. *M. corymbosa* has been found only on the Drakensberg mountains and always growing on the banks or

in the dry beds of rivers. The flowering time is late summer to early winter and the shrubs produce an abundance of dense corymbs of bright yellow capitula.

The possibility of describing a new genus for the specimens placed now in *M. corymbosa* was considered but rejected on account of the great similarity in habit between these and the rest of the species of *Macowania*. The grounds for separation would have been the sterile ray florets and truncate style branches of the disc florets. In *M. revoluta* the capitula are sometimes borne in loose corymbs and the achenes are nearly glabrous whereas in *M. corymbosa* the capitula are always densely corymbose and the achenes are striate and glabrous. *M. revoluta* is the only other species to have brown membranous margins to the involucral bracts but the capitula are campanulate not turbinate. The short, caducous pappus is another feature common to both the above species. Geographically, however, they are distinct, *M. revoluta* being confined to the eastern Cape Province.

Macowania tenuifolia M. D. Henderson, sp. nov. *M. pulvinari* N.E. Br. affinis, sed ita differt: frutices grandiores laxiores, capitula sessilia, involucri bracteae glabrae vel minute glandulosae, folia sparse glandulosa longiora angustiora.

Frutex ad 60 cm. altus, caulibus erectis, cortice ligneo cano-fusco, parte superiore foliorum reliquiis aspera basi plana. *Folia* ad apices ramulorum congesta, luteo-viridia, erecta, gracilia, sessilia, marginibus revolutis, subtus costa centrali prominenti, apice acutis, sparse setosis, haud punctatis. *Capitula* solitaria, sessilia, terminalia, cylindrica vel turbinata. *Involucri bracteae* minute glanduloso-setosae vel glabrae. *Flores-radii* 8-11, corollae tubo angusto 4.5 mm. longo; pappi setae graciles, setosae, non caducae, corollae tubo longiores. *Flores disci* numerosi, corollae 6.5 mm. longa, parte superiore campanulata 2.5 mm. longa, pappi setae graciles setosae non caducae corolla aequilongae.

NATAL.—Vryheid, Kambula Mtn., *Acocks* 11768; Utrecht, Kaffir Drift, *Thode* A 279.

TRANSVAAL.—Heidelberg, Boschfontein, *Mogg* 25488; Nigel, Vrisgewaag G 337, 8 m. S.E. Nigel, 10 Oct., 1960. *Mogg* 20116 (PRE, holo. & iso.); Vrisgewaag 337, *Moss* 22557; Sandfontein (E. portion of Vrisgewaag), *Mogg* 25082; between Belfast and Middelburg, *Franks* in Govt. Herb. No. 9807; Lydenburg, 8 m. N.E. Dullstroom, *Codd* 536.

Rounded shrub up to 60 cm. high, stems erect, woody, with smooth greyish-brown bark below, brown, rough with the bases of leaves in the upper part, densely leafy at the apex. *Leaves* yellowish-green, sparsely setose not punctate, erect, slender, 1-2 cm. long, less than 1 mm. broad, margins revolute, midrib prominent below, apex acute, more or less mucronate. *Capitula* terminal, sessile, solitary, cylindrical to turbinate

1 cm. long, 8-9 mm. broad at the top. *Involucral* bracts imbricate, in several rows, glabrous or minutely glandular, outermost ovate acute 2.5 mm. by 1.25 mm., inner linear obtuse or acute 9 mm. by 1.5 mm., margins membranous, midrib conspicuous. *Receptacle* flat, honeycombed 2.5 mm. diam. *Ray-florets* 8-11, limb of corolla oblong, 5 mm. by 1.75 mm., tube 4.5 mm. slender, lower 2.25 mm. glabrous, white yellow above bearing short, curly hairs. *Achene* 1.5 mm. long white, villous with long erect hairs, pappus bristles in a single row, slender, yellow, setose longer than corolla tube, 6 mm. long. *Disc florets* 30-35, corolla slender, 6.5 mm. long, upper 2.5 mm. gradually inflated to 1 mm. diam., lower 2.5 mm. white, glabrous, the middle becoming yellow hairy. *Achene* 2 mm. long, white villous with long, erect hairs, pappus not caducous slender as long as the corolla, yellow, setose.

It has been realized for a number of years, that the specimens quoted here must be described as a new species of *Macowania*. In 1951 Dr. Phillips removed *Thode* 279 and *Acocks* 11768 from *Nestlera acerosa* Harv., and *Franks* in Govt. Herb. no. 9807 from *Felicia lutea* N.E. Br. and put them near *Macowania pulvinaris* N.E. Br. with *Codd* 536. Besides being geographically distinct from *M. pulvinaris*, which is found only in Basutoland and on the mountains to the south, the greater stature of *M. tenuifolia*, the narrower more glabrous leaves and sessile capitula keep the species separate.

M. tenuifolia is the only species of this genus that is known to occur in the Transvaal, and although *M. glandulosa* N.E. Br. occurs in northern Natal it has been collected only on Tabamhlope mountain in the Estcourt district.

There are small differences in the capitula of *M. pulvinaris* and *M. tenuifolia* for example the corolla tube of both disc and ray florets is longer and the pappus more slender and not at all caducous in the latter. The diagramatic sketches of the components of the capitula in Bothalia II, p. 349 give one an excellent idea of the basic features, but with regard to those of *M. pulvinaris* the style branches of disc florets are obtuse not more or less truncate, the ovary has long white silky hairs ascending in both ray and disc florets, and the pappus of the disc florets is as long as the corolla with minute ascending setae on the bristles. These points are not evident from the drawings.

From the specimens available it seems that *M. tenuifolia* has a short and limited flowering period. The only specimens in full flower were all collected in September or October while those collected in November have already grown out beyond the dry receptacles. In the National Herbarium there are two specimens which have not been quoted. Although they are very similar to *M. tenuifolia* the leaves, stems and involucral bracts are all very setose. Unfortunately one, Pole Evans from Lochiel, was collected in September and has very young capitula, and the other, *Rogers* 21564 from The Downs, was collected

in November and has only old heads. These localities are north and south of Dullstroom, where *Codd* 536 grew, so it will be advisable to wait for good flowering material before deciding if they constitute a growth form or warrant varietal distinction.

ECOLOGICAL ASPECTS OF GAME CONTROL MEASURES IN AFRICAN WILDERNESS AND FORESTED AREAS

by

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The part played by game animals in the creation of their own habitat and the result to the habitat consequent to the elimination of those animals is a study which is still in its infancy in Africa. Much field work will be required before the complex subject is fully understood. The present paper therefore is an attempt to synthesise data from a number of sources which have a bearing on the matter.

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The forests of Rhodesian teak *Baikiaea plurijuga* are an example about which a certain amount of information is available.

The Kalahari Sands, which are the latest representatives of the Kalahari system are of aoelian origin formed during the late Tertiary and redeposited during Pleistocene times. They are superimposed on Karoo sandstones and volcanics laid down during the later Mesozoic and Recent times. Usually forming a covering over a hundred feet in depth they cover an area from the Northern Congo Basin, across Barotseland far south through Bechuanaland and from Angola eastwards into Northern and Southern Rhodesia (11, 12). In Southern Barotseland and Livingstone district of Northern Rhodesia two main soil types are present. The upper layers known as the Undifferentiated Kalahari Sands are deep, loose and coarse containing no trace of clay and are infertile. The lower layers, however, contain a considerable portion of fine sands together with a little clay. These, the Transitional Sands are very much more fertile. Being the lower beds of the Kalahari Sand they are largely exposed as the lower scarp of the Zambezi valley for very many miles. (6 and 11).

The vegetational climax on the Transitional Sands is a closed dry deciduous forest of *Baikiaea plurijuga* with *Pterocarpus antunesii* on the scarp of the Zambezi or with *Acacia giraffae* in watershed forests to the west of the Zambezi. A dense impenetrable understorey of scandent shrubs largely of the genera *Combretum, Dalbergia* and *Acacia* more

or less precludes the presence of grasses. These forests, now much destroyed by fire, degenerate into a woodland of *Burkea africana, Erythrophleum africanum, Terminalia sericea, Acacia giraffae,* etc., or in some places into a thicket of *Combretum-Commiphora-Pterocarpus.* (6 and 11).

Baikiaea plurijuga is a valuable timber tree on which a considerable portion of the wealth of Barotseland depends.

It is a matter of only a few decades since these forests came under the control of man during which time three serious problems of forest management have arisen. The worst of these is, of course, fire and to quote Martin (6) "The gradual dying out of the *Baikiaea* under the influence of fire, from the woodland types, the degrading of the forest types to woodland and scrub, and ultimately the disappearance of the *Baikiaea* can be safely predicted unless protection measures are applied".

How is it that *Baikiaea plurijuga* is now being so rapidly destroyed by fire when, until very recently, it had managed to survive as a forest dominant?

The very nature of a savanna climate, with its distinct wet and dry seasons, involves the hazard of an occasional fire. Under natural conditions such fires would be caused by lightning and would therefore be liable to occur mainly in the hot season immediately prior to the onset of the rains, that is during the September to November period (1). At this time of the year, at the end of a seven months dry season all grass and littter is in a highly dangerous tinder dry condition. Even in the absence of man, therefore, the fire hazard was present annually.

Martin (6) regarded these forests as relicts of high rainfall equatorial forest but recent archaeological evidence which he himself discovered, was not interpreted and available to him before his untimely death. In the Situmpa and Machili forests, early Iron Age sherds were discovered which have been dated by the C.14 technique as belonging to about 90 A.D., and these sherds and charcoals were buried under more than three foot of aeolian sand before the soil surface was consolidated by the growth of the existing *Baikiaea* forest (4). The depth of wind-blown sand superimposed on this midden indicates the more arid conditions which must have been prevalent at the time. As the climate has undergone no major change since that time so far as is known, the *Baikiaea* forests must have actually established and matured under a savanna climate little different from that existing today (10). Since the birth of Christ there is evidence to show that there have been three minor rainfall maxima in East Africa occurring at about 350 A.D., 1150 A.D. and 1700 A.D. and two minor minima at about 800 A.D. and 1400 A.D. At these periods the rainfall was generally somewhat higher and lower than we consider normal today (2 and 10). During these climatic fluctuations the extent of the Kalahari Sand vegetation would have varied over the centuries (3).

Watson (12) considers that between one-half and two-thirds of the forests have been destroyed within the last two or three decades and attributes this largely to increased human activity. However, if conditions were right for a fire, when the lightning struck in October, say 100 years ago, the whole country should have gone up in flames in the complete absence of man-made firebreaks, roads or other protective measures.

The next management problem which the modern forester has to face is a very poor natural germination of seed. Abundant seed is produced in good years and up to 95 per cent. germination can be obtained in seed beds but in the forest germination and survival of seedlings is poor (5). When *Baikiaea* pods ripen and dehisce, the seeds are thrown a distance of up to 30 yards and then lie exposed on the surface of the ground. Baboons damage the seed pods just before they ripen whilst mice and squirrels eat the seed and seedlings (5). I, myself, have also taken *Baikiaea* seeds from the crop of a red crested bustard. The numbers of baboons in the forest may have increased somewhat at the same time as has the human population. Baboons tend to increase in the vicinity of scattered settlement doubtless because of the increased food supply created not only from the cultivation of crops but also from the pioneer trees and shrubs regenerating in secondary growth as a result of shifting cultivation. However, it is doubtful if the baboon population is really excessive or if the other species concerned are present in numbers significantly greater than they have been in the past. It is likely, in fact, that these species contribute to normal seed dispersal.

The growth of the seedling above ground is at first very small whilst a long tap root is sent deep into the soil. The hazard now facing the plant is to penetrate the dense thicket understorey of the forest and Watson (12) suggests that competition for surface moisture engendered by these shallow rooted species allows few of the seedlings to survive. Where the forest canopy is sufficiently dense to kill off the thicket understorey, profuse regeneration is found (12).

Taking into consideration the recurring danger of catastrophic fires, the poor germination of seeds and the high mortality of seedlings in the dense undergrowth, one is entitled to wonder how this fire susceptible species not only managed to survive as a dominant but even how it managed to evolve in the first place.

Let us attempt to reconstruct the growth of the forest from the beginning. A very suitable point at which to commence is the year 90 A.D. when we find a family party of early Iron Age man camped in semi-desert conditions in what is now Barotseland. Deep Kalahari Sand country is almost without running streams even today whilst in the semi-arid conditions prevailing at that time they would be non-existent away from the Zambezi itself. However, the presence of this hunting party is sufficient proof that water was available, presumably as a typical desert "pan". The vegetation was presumably similar to

that occurring today in the Kalahari Desert, a light sweet grassland dotted with a few small *Acacia* spp. and some *Terminalia*. During the rainy season herds of Game animals, elephants and buffalo, roan and sable, wildebeest and zebra would roam widely over the area drinking daily at the many small temporary pans dotted over the country. In view of the drier conditions prevailing at the time it is likely that species such as giraffe and oryx were also present. At the end of the rains most of the little pans would dry up and the game would converge during the course of the season, to the pools of greater permanency. By rolling and wallowing in these pools and drinking the muddy water, the herds themselves created and increased the size and holding capacity of the pans during the course of the centuries. Every few years a fire would run through the country started by lightning during a dry thunder storm about October and this fire, by destroying many of the seedlings and saplings of trees, would maintain the country essentially as a grassland or open savannah (1).

Primitive man, hunting with bow and arrow or with spear, required to conceal himself so as to effect close approach to his quarry. He would not therefore deliberately subject his hunting range to the abuse of an annual early burn and this fact is supported by the condition of the veld as found in Africa by early European travellers (15).

During the first three centuries A.D. rainfall increased (10) allowing a more luxuriant vegetation to establish and many of the waterholes to become more permanent. In the course of time a greater and greater multitude of large animals would assemble in the neighbourhood of the better pans during the dry season. This heavy game use of the land in the vicinity of the pools would result in local conditions of severe overgrazing and trampling. The complete removal of all flammable material would, of course, exclude fire and the result would be bush encroachment in the vicinity of permanent water, the area affected being related to the permanency of the water supply and the quantity of large animals using the pool daily during the dry season. Pioneer species would be represented by *Terminalia sericea, Erythrophleum africanum* and *Burkea africana* with some *Ochna pulchra* and *Diplorhynchus* (8) and a thicket would form in conditions which had never known fire and which would therefore be favourable for eventual colonization by a fire susceptible species such as *Baikiaea*. In the immediate vicinity of the pool soil conditions would be too wet for the establishment of tree growth and nothing but annual grasses could survive the heavy dry season grazing and trampling.

With many hundreds of animals drinking daily at a pool there would be a heavy deposit of manure over the land for a considerable distance. Thane Riney (9) has measured over 1,000 lb. of manure per acre in just such a situation and this, of course, must greatly enhance fertility. With the first early shower of rain would emerge a huge population of scarabeid dung beetles which, for the next three to four months of the rainy season, display tremendous activity in burying the fresh

droppings of the elephant, buffalo and other species (14). Where the seeds of the forest trees themselves have passed through the Game animals their viability is likely to be increased but as these seeds all ripen during the dry season they would not actually be buried by the dung beetles as the manure in which they are lying would be old and stale before the beetles become active. The beetles do not bury manure which is more than a few days old (14). During the dry season much manure is consumed and removed underground by termites.

The result of this regular heavy dressing of organic manure, most of which is worked underground by insect activity must be to create a valuable seed bed for the germination of the forest trees. See plates XIII and XIV.

The animals themselves continue to use the forest partly for browsing, and for shelter and as a refuge from predation, particularly by man. Owing to its proximity to permanent water even some of the grazing species will have to pass through en route for their daily drink. The effect of all this movement and browsing, which must necessarily be confined largely to the thicket understorey, will be the almost complete removal of flammable material and an opening up of the thicket (Guy, personal communication) thus the fire hazard is severely reduced if not completely removed over large areas and the understorey thinned out to allow the establishment of seedlings. The foliage of *Baikiaea* itself is relatively unpalatable and is hardly eaten at all by large mammals. Hoof action, the trampling of herds of buffalo and other species, over the soft sandy surface, would press into the soil many seeds which would otherwise lie free and exposed on the forest floor (Guy). Not only would these seeds be in fact, planted, but they would not be so exposed to the depredations of rodents, baboons and seed--eating birds. In the Gwaai forest there is a satisfacttory establishment of seedlings only in the vicinity of a cattle track where just such conditions would have prevailed. (Guy, personal communication.)

A *Baikiaea* forest, obviously, cannot establish in the absence of suitable soil conditions. It is now postulated, however, that even where ideal soil conditions are present such a forest cannot establish and maintain itself in the absence of a relatively high population of heavy game animals. A glance at Trapnell's (11) map of the soil and vegetation of North-Western Rhodesia is enlightening. The *Baikiaea* forests are first seen to be occupying a narrow zone for many scores of miles along the banks of the Zambezi exactly where, in recent times, the animals would concentrate, during the dry season in the vicinity of permanent water. The back country behind the forest has been maintained as open savanna woodland by periodical late fires. Where *Baikiaea* forests are established away from the Zambezi as on the western watershed or the Masese-Machili area they are always situated close enough to permanent pans to allow movement of elephant and buffalo

throughout the forests for the whole period of the dry season. Amongst others, the pool at Masese was at one time famed for its elephants (12).

With the recent severe reduction of the Game population throughout the forests and its virtual elimination from certain areas various effects on the forest are apparent. In the absence of heavy game usage round the waterholes the annual grasses tend to be replaced by perennial species (1). There is no longer a removal of grasses and other flammable material around and within the forests and this results in the highly dangerous artificial, man-made fire hazard with which the modern forester has to contend. Seeds are not trampled into the soil but continue to lie exposed on the surface for many months. There is no dressing of manure and no beetles to prepare a seed bed and the understorey of scandent shrubs gets completely out of hand and develops into a solid thicket through which the young forest saplings are unable to penetrate. To quote Watson, "It is obvious from a survey of the forest that within the last two to three decades, between a half and two-thirds has been destroyed by fire. In recent years exploitation and increased populations have created conditions under which the whole remaining areas would be destroyed within a matter of a few decades if systematic fire protection was not introduced."

Over considerable periods of time game populations would tend to fluctuate and to change and these fluctuations would have a bearing on the extent and the intensity to which the land came under their influence. With high game populations the forests would tend to spread only to be invaded by fire round the margins in periods of low game density. In the year 1886 a catastrophe overcame the ungulates of East and Central Africa when the great rinderpest epizootic swept southwards annihilating vast quantities of animals. It would be interesting, and possibly very valuable, to see whether the scars of the resulting fires are still recognisable in the forests.

The reduction of Game animals in the Kalahari Sand forest areas has not been the result of planned control but the uncontrolled overuse of the natural resource. In Government controlled game extermination operations other factors are involved. Such operations are usually aimed at the elimination of the Savanna Tsetse fly *Glossina morsitans*. Classical campaigns have been undertaken in Southern Rhodesia.

Modern hunting, with the use of firearms, requires good visibility and visibility in Africa, in savanna woodland, is usually obstructed by long grass. The first thing that the modern hunter does, therefore, is to burn the grass as early as possible in the season, without any knowledge or care of the ecological consequences.

The natural conditions under which the savanna fauna and flora of Africa have evolved has included an occasional devastating fire sparked off by lightning at the end of the dry season (1) and this occurred only at intervals of several years. Such occasional fierce late

fires, by destroying many tree seedlings and bush encroachment tended to maintain most of the country as open savanna woodland. When, however, grass is burnt early in the dry season the effect is very different.

The foliage of grass in the early stages of growth has a very high food value which is maintained until the flowering and seeding stage when this food is passed into the ripening seed. After the seed is ripened so long as the foliage remains green its food value is low but it continues to synthesise food which is continuously passed down into the roots where it is stored over winter and drawn upon for regeneration in the early spring.

It is reasonable to assume that the longer the grass is allowed to grow after the ripening of the seed, the more food will be stored in its roots and the more vigorous it will become. Conversely the earlier it is burnt off the less food it can store away, and consequently the weaker it will become. Combined with this is the draining effect of the spring shoots of the grass upon the roots before the rains break. The earlier that it has been burnt the longer will be the period in which the spring shoots will have to draw on the reserves stored in the root. If these shoots are heavily grazed by cattle or game there will be an even more debilitating effect on the plant. In other words the earlier the grass is burnt the weaker will the plant be by the time the rains come. In a series of early burning years the grass will become progressively weaker and weaker until it can no longer compete against the other vegetation. The more palatable species will be the first to suffer as the grazing will be discriminative.

The effect of fire on perennial woody vegetation is complementary to its effect on the grass. An early fire in May and June, creeping through the half green grass has no more effect on the savannah trees and shrubs than to scorch off the old leaves from the lower branches. On the other hand a fire roaring through tinder dry grass in October will cause direct injury to many of the smaller trees, shrubs and saplings.

Thus in a series of years of early burning the grass becomes progressively weaker while the woody vegetation becomes more and more dense (1).

Thane Riney has studied a Tsetse control area in the Sebungwe district of Southern Rhodesia. This area, entirely uninhabited by African or European settlement or by cattle has been subjected to one form of land use only. For over 25 years the only human activity has been the hunting of the larger mammals in an attempt to eradicate tsetse. This, of course, has been accompanied by an annual burn. Preliminary analysis of his transect data indicates that the present trend is towards decrease in perennial grass cover, increase in the amount of bare ground (now over 90 per cent.) and an increase in both the density of the woodland canopy as well as an extension in area covered by woody plants. Seven out of nine transect lines in one study area were

characterized by shrubs encroaching into grassland. Thus in the complete absence of human activity, other than fairly intensive hunting, soil erosion is being accelerated and the land is being despoiled. (Riney, personal communication April '60.)

Evidence concerning these two examples shows that in both cases the elimination of the larger game animals, whether as a result of intentional policy or not, has coincided with a serious degradation of the habitat and, suggests that those animals play an important role in maintaining proper standards of conservation in remote sparsely inhabited areas.

REFERENCES

1. Bayer, A. W. (1955). The Ecology of Grasslands. *Grasses and Pastures of South Africa.* Central News Agency, Cape Town.
2. Brooks, C. E. B. (1950), *Climate through the Ages.* Ernest Benn Limited, London.
3. Clark, J. D. (1955), A Review of Prehistory Research in Northern Rhodesia and Nyasaland. *Proceedings of the Third Pan-African Congress on Prehistory, 1955.*
4. Clark, J. D. (1959), Carbon 14 chronology in Africa South of the Sahara (MS). Read to the Fourth Pan-African Congress on Prehistory, 1959.
5. Fanshawe, D. B. (1958), Silvicultural notes on Northern Rhodesia Trees (MS). Northern Rhodesia Forest Department.
6. Martin, J. D. (1938), The vegetation of the Kalahari Sands in North Western Rhodesia with particular reference to Baikiaea plurijuga climax forest (MS). Read to the Ecological Society at Cambridge.
7. Martin, J. D. (1941), *Report of Forestry in Barotseland.* Government Printer, Lusaka.
8. Mitchell, B. L. (1961), Some notes on the vegetation of a portion of the Wankie National Park (MS).
9. Riney, T. (1960), Rhodesian Wild Life is a Natural Resource. *Wild Life* **2**, 1, March, 1960.
10. Summers, R. (1958), *Inyanga.* Cambridge University Press.
11. Trapnell, C. G. and Clothier, J. N. (1957), *The Soil vegetation and Agricultural systems of North-Western Rhodesia.* Government Printer, Lusaka.
12. Watson, H. S. H. (1951), Working plan for the Rhodesian teak forests in Sesheke District, Barotseland (MS). Northern Rhodesia Forest Department.
13. West, O. (1955), Veld management in dry summer rainfall Bushveld, *Grasses and Pastures of South Africa.* Central News Agency, Cape Town.

14. Wier, J. S. (1960), Insects and Big Game Animals. *News Bulletin* 1, 2. The Zoological Society of Southern Africa.

15. Meredith, D. and Rose, C. S. (1955), Grasslands of South African Agriculture. *Grasses and Pastures of South Africa.* Central News Agency, Cape Town.

ABSTRACT

Forests of the Rhodesian Teak *Baikiaea plurijuga* have been shown to have become established in a savanna climate not very different from that obtaining today. *Baikiaea* is very fire susceptible but became dominant in the forests in spite of the ever present danger of fire.

Since the forests have come under the influence of man, three major problems have arisen. The forests have been devastated by fire, germination of seed in the forest is unsatisfactory and many seedlings fail to penetrate the thicket understorey.

It is postulated that considerable quantities of heavy game animals concentrating in the vicinity of permanent water during the dry season remove all flammable material from these areas resulting in bush encroachment and the formation of conditions in which a fire susceptible forest tree could establish. Passing animals plant seeds by hoof action and manure them by their droppings. By burying much manure, dung beetles prepare a valuable seed bed. The passage of heavy animals through the forest keps the understotrey open thus allowing tree seedlings to establish. In the absence of game animals grass around the forests is not consumed and remains as a highly dangerous man-made fire hazard. Seeds are not planted by hoof action but remain exposed to the depredations of rodents and other seed-eating animals. There is no dung to fertilize the forest and no beetles to prepare a seed bed. Also the thicket understorey becomes impenetrable.

A modern game eradication area has been studied by Thane Riney. Hunting with firearms calls for an annual burn to increase visibility. This has resulted in an increase of woody vegetation, a decrease of perennial grasses and an increase in bare ground to over 90 per cent.

In both these examples, a reduction of the large mammal population has coincided with a serious degradation of the habitat, in one instance of a valuable forest.

Tab. XIII. Buffalo drinking at a trampled out pan in mopane wood land. Wankie Game Reserve.

Tab. XIV. Buffalo in dense mopane woodland. Luangwa Valley.

HENRY SALT AND JOHN FORBES

by

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The almost simultaneous publication of "Kirkia", to which journal we wish a useful and prosperous career, and the first part of "Flora Zambesiaca" are milestones in the botanical history of the Federation. We looked through our records of botanical collecting in the "Flora Zambesiaca" area for some other milestones appropriate for a small work to commemorate the birth of "Kirkia" and while doing so we discovered that Henry Salt collected on the coast of Mozambique in 1809 and that the statement in the "History of Botanical Collecting" in "Flora Zambesiaca" that John Forbes was "the first British collector in our area" is erroneous. Now, proceeding with more caution, we say that, as far as our present knowledge goes, Salt was the first and Forbes the second. Neither of them set foot on Federation territory, at that time *terra incognita*: nearly forty years had still to elapse before the first botanical collectors (Sir John Kirk, according to our present records) first reached Rhodesia. Salt is well known for his journey to Ethiopia: Forbes we rescue from comparative obscurity.

HENRY SALT

Henry Salt (1780-1827), F.R.S., F.L.S., was born at Lichfield (Staffordshire, England) on 14 June, 1780, and was educated at the grammar school at Market Bosworth (Leicestershire). He then studied painting with the intention of becoming a portrait painter, but his talent was apparently insufficient. He left London in 1802 with Lord Valentia, visiting India, Ceylon and (in 1805) Ethiopia. In 1809 he went again to Ethiopia on a British Government mission and it is through his "Voyage to Abyssinia", published in 1814, that his name is known to botanists, chiefly because Robert Brown's appendix to that work contains the first description of a number of African species. In 1815 he was appointed British Consul-General in Egypt, where he made a notable collection of antiquities and presented a statue of Rameses II to the British Museum, which later bought his first collection for £2,000. His second collection went to France and his third collection, sold at Sotheby's, was also bought in part by the British Museum. He married a Miss Pensa in 1810: she died in 1824. Salt himself died eight years later at Dessuke, near Alexandria, in October 1827.

He gave his plant specimens to Sir Joseph Banks, whereupon they came into the hands of Robert Brown, who studied them with his usual care. They are now in the British Museum (Natural History) with the rest of the Banksian Herbarium.

On the voyage to Ethiopia, Salt landed at the Canary Islands, the Cape Peninsula and at various points on the coast of Mozambique. Unfortunately, Brown published only the Ethiopian plants in his

Appendix, but he determined the Mozambique ones and Salt himself referred to several of them in the general text of the "Voyage to Abyssinia" (see Itinerary, Aug. 19 and 27). This, as far as we know, was the second publication of the Latin names of any plants from the "Flora Zambesiaca" area (the first was by Loureiro in his "Flora Cochinchinensis", 1790).

The species collected seem to have been mainly either plants of the mangrove swamps or aquatics. The "new and beautiful Combretum" (Itinerary, Aug. 19), certainly new at the time, is *Combretum microphyllum* Klotzsch. The "new species of Aeschynomene related to aspera, named by Dr. Browne, since my return, cristata" (Itinerary, Aug. 27) is of some interest. The specimen, collected at Mesuril (Mossuril) has a ticket in Robert Brown's handwriting "Aeschynomene cristata Nob. nov. sp. Mozambia in the water". The specimen is thus the basis of *Aeschynomene cristata* R.Br. ex Salt in Voy. Abyss.: 32 (1814) *nomen nudum*. Fortunately, this plant is identical with *Aeschynomene cristata* Vatke in Oest. Bot. Zeitschr. 28: 215 (1878) based on a Hildebrandt specimen collected in Zanzibar in 1873. Vatke's name is apparently entirely independent of Robert Brown's, although both chose the same appropriate epithet.

The Itinerary given below will serve to localize all the Salt specimens from Mozambique yet found and, we hope, any others which may be discovered in the future. It has been compended from Salt's "Voyage to Abyssinia" (1814).

ITINERARY

20 January, 1809 .		Embarked *Marian*, merchant vessel commanded by Captain Thomas Weatherhead.
15 to 18 March .	Canary Islands.	
20 April to 27 July .	South Africa .	Cape Town, Simon's Bay.
17 August . . .	Mozambique .	Cape St. Sebastian.
18 August . . .	Mozambique .	At anchor off Inancata Island.
19 August . . .	Mozambique .	Sofala. Elephant Point. "... and therefore returned to the boat, after having collected a few specimens of plants, among which the following may be enumerated; a new and beautiful Combretum, Rhizophora gymnorhiza Linn.; Sonneratia ascida Linn. Suppl.; Avicennia tomentosa Linn. (rack-tree of Mr. Bruce); a species of Sapindus; and another of Diospyros, probably not described."
20 August . . .	Mozambique .	Sailing.
23 August . . .	Mozambique .	Angoxa Islands.
25 August . . .	Mozambique .	North of Mozambique, a village called Mozimbe; St. George's Island, at anchor (Mozambique Island).
26 August . . .	Mozambique .	Visited fort on Mozambique Island.

27 August	Mozambique	Mesuril. "In the shallower part grew several beautiful water-plants, of which we with difficulty obtained specimens. The most remarkable of these were the Nymphaea coerulea Hort. Kew ed. 2, Vol. iii, p. 294, Pistia stratiotes Linn., and a new species of Aeschynome related to aspera, named by Dr. Browne, since my return, cristata." Monjou.
28 to 31 August	Mozambique	Mesuril.
1 to 4 September	Mozambique	Aboard the *Marian*.
5 to 7 September	Mozambique	Mesuril.
8 September	Mozambique	Governor's House (Mozambique Island).
9 September	Mozambique	Across the Isthmus of Soue Souah.
10 September	Mozambique	Mesuril.
11 September	Mozambique	Left Mesuril, returned Mozambique. Cabaceiro.
12 to 15 September	Mozambique	Mozambique.
1810		
16 to 27 June	Abyssinia	
15 July to 4 October	India	Bombay.
4 to 11 December	South Africa	Cape of Good Hope.
29 December	St. Helena	
1811		
10 January	England	Penzance, Cornwall.

PUBLICATIONS

Twenty-four Views of St. Helena (1809).

A Voyage to Abyssinia and Travels into the Interior of that Country &c. (1814).

Essay on Dr. Young's and M. Champollion's Phonetic System of Hieroglyphics with some additional discoveries (1825).

REFERENCES

Gentlemen's Magazine 1: 374 (1828).

Lasègue, A., "Musée Botanique": 167, 301, 323, 504 (1845).

Hall, J. J., Life of Salt (1854).

Redgraves, Dictionary of Artists of the English School (1878).

Dictionary of National Biography 50: 212 (1897).

Britten, J., & Boulger, G. S., revised Rendle, A. B. A biographical index of the deceased British and Irish Botanists: 267 (1931).

Dawson, W. R., The Banks Letters: 730-732 (1958).

JOHN FORBES

John Forbes was probably born in 1798 (the date is uncertain) and became a pupil of John Shepherd at Liverpool Botanic Gardens. In 1822 he was sent by the Horticultural Society of London (now the Royal Horticultural Society) on a naval expedition commanded by Captain W. F. W. Owen of H.M.S. *Leven*, charged with making a survey of the east coast of Africa. On this voyage, Forbes visited Portugal, Madeira, Cape Verde Islands, Rio de Janeiro, Cape of Good Hope, Alagoa Bay, Delagoa Bay, Madagascar, Comoro Islands and Mozambique, where he died.

In Mozambique, Forbes left the main expedition and went up the Zambezi on 23 July, 1823, with two officers, Lieut. C. W. Browne and Mr. C. Kilpatrick, and their servants, Adonis and Antonio. He died on 16 August, 1823, before reaching Sena, and the two officers shortly afterwards. Adonis and Antonio returned to Quelimane, where they waited for the return of the main expedition and related the events of this ill-fated venture.

Although Forbes' specimens are usually cited rather vaguely as from "Mozambique" or "Zambezia", it is possible to localize most of them from the Itinerary given below (compiled from his Journal) and it seems certain that none of them was from the Zambezi itself, for nothing survived of the collections made during the ascent of the river.

His specimens and journal were returned to the Horticultural Society and remained in their possession until 1843, when the specimens were sold, at a time when the Society was in financial difficulties. Sets went to the British Museum, Geneva, Kew, Lindley (now in the Cambridge Herbarium) and Lund. Most of Lindley's specimens marked H.S. in his herbarium were specimens preserved from plants grown from seeds obtained from the Horticultural Society, but in the case of the Forbes specimens there is no doubt that they were the original specimens collected on the voyage.

There has been a certain confusion about John Forbes because B. Daydon Jackson, in writing an account of him in the "Dictionary of National Biography", credited him with a doctor's degree (M.D.) and referred to Rév. Encyl. 12: 574 (1824) in which a work by a Dr. J. Forbes entitled "Observations on the Climate of Penzance" (1821) was reviewed. Daydon Jackson, however, mixed up two persons, both named John Forbes and living during the same period. The author of "Observations, etc." was Sir John Forbes, M.D. (1787-1861), who eventually settled in Penzance and devoted himself to meteorological, geological and botanical investigations.

About our John Forbes we can find but little more. Captain W. F. W. Owen, R.N., wrote of him (in "Narrative of Voyages to Explore the Shores of Africa, Arabia and Madagascar" (1833)): "The death of this deservedly esteemed young man was a sad blow to the survivors, for, besides the services which from his attainments and perseverance he was

qualified to render to the expedition, he was greatly endeared to them by a mild and agreeable disposition." On the tablet in Chiswick churchyard, erected by the Horticultural Society to his memory, is the following inscription: "To the memory of Mr. John Forbes, A.L.S., a botanical collector in the service of the Hort. Soc. of London, who died at Senna on the Zambazee river, in Eastern Africa in the month of August, 1823, in the 23rd year of his age. This tablet is erected by the Council of the Society, in testimony of their entire approbation of his conduct while in their service, & of their deep regret at the untimely fate of a naturalist of so much enterprise & promise."

Among the plants named after him were the genus *Forbesia* (Amaryllidaceae) and the species *Amaryllis forbesii, Cattleya forbesii, Grewia forbesii* and *Oncidum forbesii.*

ITINERARY

1822		
4 February		Embarked.
8 to 12 March	Madeira	
16 to 18 March	Teneriffe	
19 March	Santa Cruz	
25 March to 5 April	Cape Verde Islands	
1 May to 9 June	Brazil	Vicinity of Rio de Janeiro.
July 7 to 17 September	South Africa	Simons Town; Cape Town; Port Elizabeth.
19 to 26 September	Sailing for Delagoa Bay	
27 September	Mozambique	Delagoa Bay, at anchor in English River.
28 September	Mozambique	English River, visited Portuguese fort at Reuben Point.
29, 30 September	Mozambique	English River, Forbes spent day bringing equipment to observatory originally the house of Governor.
1 October	Mozambique	Lake Moonyana, Forbes visited lake with Captain Lechmere. "Planted some of the vines brought with us from the Cape. I believe the first ever planted in the Colony. Vines have been introduced here before by the Portuguese but either thro' mismanagement, climate, soil or local situation they have not succeeded and at present there is not one existing in this part of Africa."
2 October	Mozambique	English River, Observatory.
3 October	Mozambique	Up English River to camp on Refuge Island.
4 October	Mozambique	Mattol River, Tembey River, "going due north" returned when river became too shallow.
5 October	Mozambique	Mattol River, looking for water, returned to Refuge Island, travelled up the Tembey River to survey it, remained on river bank.
6, 7 October	Mozambique	Tembey River, surveying.
8 October	Mozambique	Most southerly branch of Tembey River, exploring (26° 17′02 S.).

9 October . . .	Mozambique .	Tembey River, exploring, 26° 16′ 19;S. 32° 30′ 00;E.
10 October . . .	Mozambique .	Tembey River, returned down river.
11, 12 October . .	Mozambique .	English River, returned down river.
13 October . . .	Mozambique .	Fort on English River.
14 October . . .	Mozambique .	Fort on English River. "Planted Loquat and Orange Trees in the Lieut. Texeira's Garden, which were afterwards overrun by the wild shrubs and lost."
15, 16 October . .	Mozambique .	Northerly direction from Fort, collecting.
17, 18 October . .	Mozambique .	Collecting in vicinity of Fort.
20 October . . .	Mozambique .	Dundas River, went collecting near lake.
21 October . . .	Mozambique .	Lake, near Dundas River.
22 October . . .	Mozambique .	Fort.
23 October . . .	Mozambique .	"Lakes", collecting with Mr. Gibbons.
24 October . . .	Mozambique .	Refuge Island.
25 October . . .	Mozambique .	English River.
26 October . . .	Mozambique .	H.M.S. *Leven*.
27 October . . .	Mozambique .	In vicinity of Fort.
28 October . . .	Mozambique .	Fort.
29 October . . .	Mozambique .	Fort. ". . . The vines we planted soon after we came, coming into leaf."
30 October . . .	Mozambique .	Collecting in vicinity of Fort.
31 October . . .	Mozambique .	Observatory, Forbes collecting up his luggage.
1 to 10 November .	Mozambique .	H.M.S. *Leven*, Forbes developed fever (9 November, Capt. Lechmere died).
11 November . .	Mozambique .	Reuben Point, Forbes with fever.
12 to 18 November .	Mozambique .	H.M.S. *Leven*, Forbes with fever.
19 November . .	Mozambique .	Shefean Island, H.M.S. *Leven* anchored near mouth of King George's River (Manees River), Forbes visited Shefean Island.
20 November . .	Mozambique .	Shefean Island.
21 to 26 November	Mozambique .	H.M.S. *Leven*, Forbes with fever (Lieut. H. A. Gibbons, died).
27 November . .	Mozambique .	Elephant Island (Gibbons Island).
28 to 30 November .	Mozambique n	H.M.S. *Leven* sailed from Delagoa Bay.
1 to 20 December .	Mozambique .	H.M.S. *Leven* sailing for St. Mary's on east coast of Madagascar.
21 December . .	Madagascar .	St. Mary's Isle, anchored off south point.
22 December . .	Madagascar .	St. Mary's Isle, anchored off south point.
23 December . .	Madagascar .	St. Mary's Isle—Quail Island.
24 December . .	Madagascar .	St. Mary's Isle, Forbes visited the garden of Monsieur Le Nore.
25 to 28 December .	Madagascar .	H.M.S. *Leven*.
29, 30 December .	Madagascar .	St. Mary's Isle, Forbes went collecting.
1823		
1 January . . .	Madagascar .	St. Mary's Isle, Forbes visited Monsieur Le Nore again.
2 January . . .	Madagascar .	H.M.S. *Leven*.
3 January . . .	Madagascar .	St. Mary's Isle, Forbes visited a village.
4 January . . .	Madagascar .	H.M.S. *Leven*.
5 January . . .	Madagascar .	St. Mary's Isle.
7 to 22 January .	Madagascar .	H.M.S. *Leven* sailed for the Comoros.
23 January . . .	Comoros . .	H.M.S. *Leven* sailed by Johanna, Great Comoro and Mohilla.

28 to 30 January	Comoros	Surveying coasts (not landing) of Makalow, Queramba, Oiba Matema River, Boimba, Point du Diable, Point Almeyeca.
31 January	Comoros	H.M.S. *Leven*.
1 February	Mozambique	Rio Fernando Vilosa, Quintangoa Point, anchored Mozambique.
2, 3 February	Mozambique	Mozambique Island.
4 February	Mozambique	Mozambique Island. Visited Governor Joa Manuel do Silva, with Mr. Browne and was introduced by Capt. Owen.
5, 6, 7 February	Mozambique	Mozambique, mainland.
8, 9, 10, 11 February	Mozambique	H.M.S. *Leven*.
12 February	Mozambique	Mafamale Island (10° 25′ S., 39° 45′ 43; E.).
13 February	Mozambique	Angosa (Angoche) Island (17°S. 40°E.).
14 February	Mozambique	Landed on Raza Island.
15 to 17 February	Mozambique	H.M.S. *Leven*, sailing.
18 February	Bassas do Irideo	Shoal of Jewels or Bassas de India, did not land.
20 February	Bazocouta (Baxaruto) Islands	At anchor.
21 to 28 February		H.M.S. *Leven*, sailing.
1 March	Mozambique	Delagoa Bay, English River, at anchor.
2 March	Mozambique	Delagoa Bay, English River, on shore.
3 March	Mozambique	Delagoa Bay, Lake Moonyana. "The vine cuttings that were planted by us in the Governor's Garden are about one half of them alive and some attention has been paid to them by the present Governor."
4 March	Mozambique	Delagoa Bay, Lake Moonyana. Drying plants.
4 March	Mozambique	Temby River, 4–5 miles south.
6 March	Mozambique	H.M.S. *Leven*.
7 March	Mozambique	Delagoa Bay, on shore.
8 March	Mozambique	Point Mahon (Tembey River side).
9, 10 March	Mozambique	H.M.S. *Leven*.
11 March	Mozambique	Visited King Kapell's village, inland south of Tembey River (15 miles inland), to obtain the King's signature to treaty giving Britain permission to protect his land. "We took some Mango seeds with us brought from Madagascar and planted them in a favourable situation with hopes that they will have a better fate than the Loquat Plants given to the Portuguese."
12, 13 March	Mozambique	H.M.S. *Leven*.
14, 15 March	Mozambique	Shefean Island.
16 to 21 July	South Africa	Port Elizabeth, Simons Bay, Alagoa Bay.
22 July	Mozambique	H.M.S. *Leven*.
23 July	Mozambique	Party left Quilimane.
24 July	Mozambique	Passed small Masave River; landed at Morangane (Millambeny).
25 July	Mozambique	Moona; Chambasc; Cocha.
28 July	Mozambique	Boca do Rio (47 miles from Quilimane). (Maccoomboosh.)
30 July	Mozambique	Left Boca do Rio.
2 August	Mozambique	House of Paulo Mariano.
3 August	Mozambique	Confluence of Luabo and Zambezi Rivers (Forbes sick.)

4 August	Mozambique	Chaponga (Forbes sick) (Donna Pascoa d' Almeydo's house).
11 August	Mozambique	Expedition travelling towards Senna.
12 August	Mozambique	Yemala near Senna (Forbes sick).
16 August	Marooro	Travelling towards Senna; Forbes died.
17 August	Marooro	Senna; Forbes buried.
1 September	Marooro	Browne and Kilpatrick arrived at Senna and obtained permission to travel to Tete.
5 September	Marooro	Senna, Lieutenant C. W. Browne died.
28 October	Marooro	Chaponga; Mr. G. Kilpatrick died.

REFERENCES

Hooker's Exotic Flora 2: 115 (1824).

Trans. Hort. Soc. 4: iii (1824).

Loudon's Gard. Mag. 1: 360 (1826).

Owen, Capt. W. F. W., R.N., "Narrative of Voyages to Explore the Shores of Africa, Arabia and Madagascar" (1833).

Lasègue, A., "Musée Botanique": 326, 327, 329, 376, 502 (1845).

Dictionary of National Biography, 19: 405 (1889) (by B. Daydon Jackson).

Wilks, Rev. W., "A short Historical Sketch of the Royal Horticultural Society" (1890).

Britten, J., and Boulger, G. S., revised by Rendle, A. B., "A biographical index of the deceased British and Irish Botanists": iii (1931).

Gomes e Sousa, A. de F., "Exploradores e Naturalistas da Flora de Moçambique" in Moçambique, Fasc. 20: 33-69 (1939).

Simmonds, A., "The History of the Royal Horticultural Society, 1804-1954": in Journ. Roy. Hort. Soc. 79: 468 (1954).

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SOME NOTES ON THE TAXONOMY, DISTRIBUTION, ECOLOGY AND ECONOMIC IMPORTANCE OF WIDDRINGTONIA, WITH PARTICULAR REFERENCE TO W. WHYTEI

by

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The genus *Widdringtonia* was first described by Brongniart in 1833, as *Pachylepis*, a name which had been used the year before by Lessing for a genus of Compositae. In 1841 it was called *Parolinia* by Endlicher. This name too had been used already, by Webb, a year earlier for a genus of Cruciferae. Once more a new name was required, and in the following year, 1842, Endlicher renamed his genus *Widdringtonia* to commemorate Captain Widdrington, R.N., F.R.S. (né Samuel Edward Cook, the traveller and writer), who worked on the Coniferae in the late years of the eighteenth and the early years of the nineteenth centuries. Bentham and Hooker (*Genera Plantarum*, 1883) reduced the genus to the rank of a sub-genus of the Australian *Callitris*, and they were followed by Eichler in Engler & Diels, *Die Natürlichen Planzenfamilien*, **2**, 1: 93 (1889), Dalla Torre & Harms *Gen. Siphon.*, **1**: 3 (1900)) and others. *Widdringtonia* is however retained as a genus in all more recent publications (e.g., *Flora of Tropical Africa, Flora Capensis, Handbook of Coniferae* by Dallimore and Jackson, ed. 3, 1948, Pax in Engler & Diels, *Die Natürlichen* Planzenfamilien ed. 2, **13** and *Flora Zambesiaca* 1, 1 (1960)).

As a group the Widdringtonias are known as the "African Cypresses" They are the African analogues of the true Cypresses of Southern Europe, Asia and Western North America, which they resemble in habit and foliage. Although closely related to the Australian *Callitris* and to the monotypic *Tetraclinis* of North Africa and Malta, *Widdringtonia* can easily be distinguished from them by the characters given in the key below.

1. Lvs. opp. and decussate; cone-scales 4, all of same size, not deeply sulcate at base ... ... *Widdringtonia*

1a. Lvs. in whorls of 4; cone-scales 4, in 2 prs., one pr. broader than the other, deeply sulcate at base ... ... *Tetraclinis*

1b. Lvs. in whorls of 3; cone-scales 6, in 2 whorls of 3, one whorl longer than the other, usually not sulcate at base ... ... *Callitris*

Despite the well marked differences between *Widdringtonia* and *Callitris*, experts have sometimes confused them. Thus, *W. equisetiformis* described by Masters from the Katbergen in the Stockenstrom division of the Transvaal is only a cultivated form of *Callitris robusta* R.Br., probably introduced at a Mission station. Erdtman and Thomas (1958) have recently made a comprehensive study of the chemistry of the Cupressaceae, but the present writer feels that he is not in a a position to assess the significance of their findings.

GENERIC DESCRIPTION

The Widdringtonias are evergreen trees, or occasionally shrubs. The leaves on juvenile plants are spirally arranged, linear, flat and long-pointed; in older trees (except on the long shoots) scale-like and arranged in alternating pairs; on long shoots intermediate, but sometimes juvenile and mature types and transitional forms are found. There appears to be some doubt as to whether the genus is monoecious or dioecious. Although according to the "Handbook of Coniferae" it is monoecious, Stapf in the Flora Capensis" suggests that this may not be invariably the case, while the "Flora of Tropical Africa" states definitely that the genus is dioecious. The Flora Zambesiaca implies that they are usually monoecious. The male strobili are small, terminal and mostly on short lateral branchlets; the microsporangiophores are decussate, rhomboid-deltoid produced into a beak or short point, or are obtuse and have two pollen-sacs at the base. The female strobili are small, scattered along elongated shoots, singly or in dense clusters, rarely "racemose". The megasporangiophores are opposite in two alternating pairs, divaricate at the time of pollination, then closing up, corky, coriaceous, apiculate; there are three or more ovules at the base of each scale. The mature strobili or cones are about the size of a small plum, woody, smooth or rough, ovoid or globose, opening with four very thick, erect valves, corresponding to the four scales; they persist often for a considerable time after shedding the seed. The seeds are numerous, ovoid, sometimes curved, with two wings; there are two cotyledons.

WOOD STRUCTURE AND ECONOMIC IMPORTANCE

Nowadays only one species, *W. whytei,* yields timber large enough or in sufficient quantity to be of economic significance. At one time the forests of *W. juniperoides* in the Western Cape provided a valuable source of high quality softwood, and so to a less extent did the small stands of *W. schwarzii* in the Eastern Cape. The wood of all three species is soft and light to moderately heavy, fragrant, sometimes very resinous and extraordinarily durable. There appears to be little information about the wood of *W. schwarzii;* it is unlikely, however, that it differs appreciably from the other two, in which the sapwood is pale in colour, sharply defined and in old trees very narrow. There are no resin ducts. Although it is not easy to separate them with certainty, generally speaking the wood of *W. juniperoides* is lighter in colour and with a less pronounced fragrance and the annual rings are rather more distinct than with *W. whytei.* Microscopically these woods are distinguished readily from all the other conifers except *Callitris macleayana* and *Podocarpus* spp. From these the Widdringtonias may be distinguished by their characteristic fragrance and pronounced taste, and also from *Podocarpus* spp. by the dark contents of the ray cells; these render the rays visible to the naked eye and impart colour to the wood.

The timber of all three species is known locally as "Cedar"; in the Cape, *W. juniperoides* and *W. schwarzii* are called respectively "Clanwilliam Cedar" and "Willowmore Cedar", whilst *W. whytei* is the "Mlanje Cedar" of Nyasaland. Although the Widdringtonias are quite distinct botanically from the true Cedars (*Cedrus* spp.) which are confined to the mountains of Syria, Asia Minor, Cyprus, the Atlas range and the Himalaya, their timber has better claims to the name of "Cedar" than that of most of the 70 or more other coniferous and hardwood species which (with various qualifications) are known by that name. The timber of the true Cedars possesses a characteristic sweet scent very closely akin to that of the Widdringtonias, and the wood of both genera yields, when distilled, a pleasantly scented oil. Remarkable durability is a property of both true Cedar and *Widdringtonia* timber. Both woods are completely insect proof but are useless for boxes or cabinets as the contents are liable to be damaged because of the deposition upon them of the resinous matter in the wood. The only other tropical African conifer whose timber is called "Cedar", *Juniperus procera,* the "African Pencil Cedar" of Kenya and Tanganyika, is found in localities where *W. whytei* is now sometimes planted as an exotic. Its rather scented, durable wood might, in the rough-sawn form, be mistaken by an uninformed person for *W. whytei.*

TAXONOMY

The last careful and comprehensive taxonomic study of *Widdringtonia* is that of Stapf, published as part of the supplement to the *Flora Capensis* in 1933. Subsequent accounts are derived from Stapf's revision and add very little new information. Stapf maintained six species, but one of these, *W. stipitata,* has not been kept up by later workers and is now regarded as a synonum of *W. whytei.*

The following key, based on that of Stapf, shows how the five remaining species are distinguished, but it should be emphasized that the material available to Stapf, who had not studied the species in the field, was limited, and it is possible that a more detailed study involving field observations and the analysis of larger samples would result in some of Stapf's species being demoted in taxonomic rank.

1. Ovules 6-10 on each megasporangiophore; mature seeds up to 20-30 or more per cone; pollen sacs protruding between the microsporangiophores:

    2. Mature cones (before opening) globose-ovoid or obversely pyriform, up to 1.4 cm. in diam.; subapical cusps usually well-marked and pointed ... ... 1. *W. whytei*

    2a. Mature cones (before opening) globose, up to 1.8 cm. in diam.; subapical cusps usually small and blunt, sometimes vestigial ... ... 2. *W. cupressoides*

1a. Ovules 3-4 on each megasporangiophore; mature seeds up to 12 (-14) per cone; pollen sacs concealed by the microsporangiophores:

3. Mature cones not tuberculate along the margins of the valves but more or less wrinkled all over the surface; wing of seed notched at apex ... ... 3. *W. dracomontana*

3a. Mature cones coarsely tubercled along the margins of the valves:

4. Seeds rather flat, 0.8-1.2 cm. long; wing not notched at apex ... ... 4. *W. schwarzii*

4a. Seeds plump, triquetrously ovoid, 0.8 cm. long, wing notched at apex ... ... 5. *W. juniperoides*

In Nyasaland *W. whytei* is far from uniform, and a number of variants have been recognized from Mt. Mlanje and from plantations on Zomba Mountain. None of these have been given formal taxonomic status. A brief conspectus of their characteristics follows:

(a) *Typical form.* A magnificent timber tree reaching a height of 140 feet, sometimes with a clear bole for 60 feet or even more, and a diameter of 5½ feet at 6 feet from the base. Bark of old trees very thick and fibrous, the outer layer being shed annually; as with the Californian Redwood it is possible to strike the trunk with the clenched fist without injury to one's knuckles. The branching is symmetrical in young trees, which are of upright pyramidal habit. In later life heavier, unequal branching may develop, resulting in a somewhat flattened, wide-spreading crown. Juvenile leaves spirally arranged, glaucous-green, up to 2.5 cm. long, becoming gradually smaller as the tree ages; adult leaves scale-like, opposite and decussate. Mature cones ovoid, 1.2-3.5 cm. x 0.8-1.8 cm. Seeds ovate to lanceolate, dark brown and with two spreading wings. This form does not coppice.

(b) *Scaly form.* Differs from (a) only in that the branching always remains short and regular, and even in youth the foliage is scale-like.

(c) *Dwarf form.* A multiple stemmed shrub or small tree which may attain 15 feet in height and is said to bear a close general resemblance to *W. cupressoides.* Bark similar to (a), but not so well developed. The foliage is scale-like, dark green and glossy. Cones slightly larger than in (a), borne in abundance even when the plants are only 5 or 6 feet high. This form coppices vigorously, the young coppice shoots bearing the juvenile needle-like foliage. It is usually restricted to the more rugged terrain above the general plateau level and may occur up to 8,000 feet above sea level or even higher, either forming low dense stands in rocky water channels, or scattered individually among the rocks and slabs.

(d) *Glaucous form.* A bushy, short-stemmed plant 15/20 feet high. Bark similar to (a) but not so well developed. Foliage glaucous or glaucous-green, and much finer branching; not unlike a *Philippia* in habit. Whether it has the ability to coppice is not known. Unlike the dwarf *Widdringtonia* this form is very localized, and up to the present only one very small group of trees has been found, on the

steep bank of Lichenya River, where it contrasts strikingly with the large trees of the typical form which surround it.

(e) *Zomba Mountain form.* Small tree with a short, crooked stem, irregular branching and the ability to coppice strongly. In the colour of its foliage and in general habit this form appears to bear some resemblance to (d), and although the seed from which the Zomba trees were raised probably originated from Tuchila plateau rather than Lichenya, it seems reasonable to suppose that the glaucous form may well have occurred there too. Until these two forms have been carefully compared it will not be possible to assess the status of the Zomba Mountain form more accurately.

It is not known how variation in Southern Rhodesia, Portuguese East Africa and the Transvaal compares with that in Nyasaland. Photographs (Journal of South African Botany, Volume IV, 1938, Plate 45) suggest that the Rhodesian tree is a depauperate variation of (a), and from the very limited information available this would also appear to be the case in Portuguese East Africa. In the Transvaal *W. whytei* is described (The flowering plants and ferns of the Transvaal, Part I, 1926) as a shrub or small tree 10-15 feet in height.

DISTRIBUTION, ECOLOGY AND EXLOITATION OF THE INDIVIDUAL SPECIES

Widdringtonia juniperoides Endlicher

Known usually as the "Clanwilliam Cedar", this tree is the "Cedarboom" or "Cape Cedar" of the early Cape Colonists. It is confined to the Cedarberg range of the Western Cape, to which it has given its name. The surviving trees occur singly or in small clumps scattered over the bare, craggy mountains or in the deep narrow kloofs which cut back into their recesses. The Cedarberg is a rather narrow sandstone range some 30 miles in length and varying in altitude from about 3,000 to 6,500 feet above sea level. The rainfall of 20 to 40 inches a year is confined to the winter months, when snow often falls above about 3,500 feet. During the summer the weather is very hot and dry, with a correspondingly severe fire hazard. The tree does not descend far below the snowline and is found up to 4,000/5,000 feet above sea level. The unrestricted exploitation of the nineteenth century and the devastation caused by fires which have swept the mountains periodically for probably a hundred and fifty years have depleted the forests almost to vanishing point. Even today, although for many decades timber cutting has been strictly controlled, fire remains the most serious factor in the steady destruction of the remaining trees and the prevention of natural regeneration. In the Cedarberg the fire policy is to protect completely. Over such a vast area this is unrealistic under prevailing conditions and can lead only to the occurrence of fierce fires at more or less widely spaced intervals, even though protective measures may succeed for several years at a stretch. A walk in the Cedarberg now is a depressing experience for a forester.

Such trees as have survived the fires are scattered sparsely over the rocky slopes. They are stunted, usually averaging about 20 feet in height, with gnarled, wide-spreading crowns. Natural regeneration is in most cases conspicuously absent. Probably 90 per cent. of the trees which one does see are dead, often burnt through at the base and with the wreckage supported by surrounding rocks. Admittedly, in some of the kloofs there are trees of 40 feet or more in height, and enough regeneration has managed to survive in a few sheltered hollows and crevices among the rocks to indicate that in the absence of fire the tree can perpetuate itself.

An interesting article on early 19th century records of *W. juniperoides* appeared a few years ago (Smith, 1955). Smith points out that the recommendations for the protection and regeneration of the forests made to their respective Governments by the three members of Commissary de Mist's Commission (1803) and by the British geographer, Sir John Alexander (1838) will always be regarded as the first examples of the advocation of conservation measures for indigenous forest in South Africa.

Early in the nineteenth century there was a regular production of beams twenty feet long and six inches square, and of planks up to eighteen inches in width and an inch and a half thick. Sir John Alexander writing in 1838 of a visit which he had made to the Cedarberg two years earlier mentions a tree of 36 feet in girth and which yielded 1,000 feet of sawn plank. The wood was extensively used for many decades for a variety of purposes, both in the neighbourhood of the mountains and as far away as Cape Town. As early as 1803 there is a record of the "Cedar" being particularly prized for water wheels by local farmers. The pews and doors of the English chapel at Clanwilliam are of the wood and the carved altar front illustrates well its attractive silvery graining when quarter sawn. At one time large quantities of the wood reached the furniture makers of Cape Town. Nowadays there is only an insignificant out-turn of small dimensioned timber from the burnt trees which are pit-sawn in situ. Little progress has been made with artificial regeneration, even though seed can be obtained fairly easily still, and nursery practice is simple. Possibly such plantations as have been formed, for example at Middelberg below the lip of the range above Algeria Forest Station, are not at a sufficient altitude for the tree. For vigorous growth it may be that the winter snows and mists about 3,500 feet altitude are necessary.

Widdringtonia schwarzii Marloth

Known as the "Willowmore Cedar", this species is restricted to the Willowmore Division of the Eastern Cape Province where it occurs in the Baviaans Kloof Mountains at 2,600 feet. / 4,000 ft.

According to J. H. Ward (1958) the trees are found on shady, southerly aspects and where no other site is available are capable of rooting on ledges and in crevices among the rocks. The soil is poor and

sandy, derived basically from Table Mountain sandstone with occasional basalt sheets. The landscape is grim and formidable to an extreme and the inner ranges, where not naked rock, support only a sparse rhenosterbosch. The rainfall varies from 8 to 15 inches and the climate is typical of the Karoo, with extremes of heat and cold.

Where the trees are growing high on the krantzes, a tall, graceful stem is developed in the early stages, lightly branched and up to 40 ft. high. Later, however, growth becomes stunted, the trunk becomes gnarled and thickened, the lower branches die off, and the tree finally assumes its typical sombre and antique appearance. But where conditions are favourable, as in the more inaccessible upper kloofs, small stands of fine trees are still found, occupying more level and open situations. There they appear in what one imagines to be their pristine magnificence, growing to 90 ft. in height and with a girth of up to 10 ft.

As with all the species of *Widdringtonia*, the worst enemy of the tree is fire, due to the high inflammability of the wood. Indeed, signs of damage are evident on many of the older trees, especially those growing in open situations. Much of the Baviaans Kloof Mountains is Crown Forest and the Widdringtonias are said to be adequately protected by a Government Forester at Studhis. In fact the abundance of young and comparatively vigorous trees in certain parts speaks well of the methods in use, but in the past police action was necessary to prevent illegal exploitation. Even so much excessive cutting must have taken place in the past, for in such a generally treeless area any timber would have been highly prized for building, fencing and even as firewood. At the farm Riet Rivier there is an old corn mill and homestead with flooring boards, beams and doors of Cedar, probably a century old. The resistance of the wood to decay is evident in the profusion of gates and fencing posts within a radius of 40 miles. Attempts to propagate the species elsewhere on any scale do not seem to have met with success.

Widdringtonia cupressoides Endlicher

The "Berg Cypress" as this species is called occurs eastwards from the Table Mountain range along the Amatola mountains to the Transkei, except where it is replaced by *W. schwarzii* in the Willowmore division. To the north it occurs as far as Natal and the Drakensberg. Although under specially favourable conditions it may form a small tree, it usually occurs as a shapely shrub 6-12ft. in height. According to Sim use was at one time made of this species in the afforestation of drifting sands in the Western Province.

A characteristic which it shares with the dwarf form of *W. whytei* is the ability to coppice from the base after fire.

Widdringtonia dracomantana Stapf

Found in the Eastern region on certain of the mountains in the Transkei and Griqualand East. It also forms isolated woods or clumps

at high altitudes in the Drakensberg at the headwaters of the Bushman's River, in the Giant's Castle game reserve and between Cathkin Peak and Mont-aux-Sources. Usually it occurs as a shrub 8-10ft. high and only very rarely as a small tree.

Widdringtonia whytei Rendle

This, the "Mlanje Cedar", is the northernmost and only tropical species of the genus Although it also occurs in Southern Rhodesia, Portuguese East Africa, and in the Transvaal it reaches its maximum development in Nyasaland on the Mlanje Mountains at 16° South, its northernmost station. Covering approximately 150 and 30 square miles, the Mlanje range and Mchese Mountain are separated by a 4,000-foot saddle, the Fort Lister Gap. One of the three principal valleys containing *Widdringtonia* forest along the northern front of the Mlanje range is in private ownership. Otherwise with the exception of certain enclaves in the Fort Lister Gap and much of the lower foothill country along the south of Mlanje (the tea belt), the whole massif with its lower slopes is included within the Mlanje Mountains Forest Reserve. Whatever the extent of the *Widdringtonia* forests may at one time have been, there now remain, it is estimated, only some 10 square miles of mainly mature or over-mature forest containing (1955) 10,300,000 cubic feet of standing timber. These forests occur as isolated fragments, occasionally of considerable size but more often of very limited extent, scattered among the mountains at between about 5,000 and 7,000 feet above sea level. Usually they are confined to the upper parts of the deeply incised gorges so characteristic of the massif and particularly of Mchese Mountain, or to the ravines and hollows on several shelf-like plateaux which are a feature of the Mlanje Range at 3,000 to 4,000 feet above the level of the surrounding plains. These plateaux extend from the upper lip of the precipitous outer wall of the mountains to the base of the rocky slopes which culminate in the high peaks 3,000 to 4,000 feet above. To judge from the presence of roots and charred stumps of *Widdringtonia* which have come to light in the past in diggings on the grasslands a considerable distance from the nearest existing forest, it appears reasonable to assume that this zone of the mountains was at one time considerably more wooded than is the case to-day. Such fragments of forest as now remain may well represent but a small rearguard pushed back to the one type of habitat which affords it a certain natural protection from fire.

In Southern Rhodesia *W. whytei* occurs in the mountains of the Eastern Border and near Melsetter, but in no case does it attain there the dimensions, or occur in such concentrations, as is the case in Nyasaland. On the Mlanje range or Mchese Mountain it is possible to find blocks of forest of some hundreds of acres in extent, with individual stems not infrequently over 100 feet in height and 5 or even 6 feet in diameter at breast height. In Southern Rhodesia it is exceptional to find trees of over 50 feet in height and an average of 25 feet is much more usual. Describing the closed forests of the Eastern

Border Mountains, Henkel (1931) and Gilliland (1938) state that *W. whytei* occurs in small patches of forest in the kloofs and on the higher slopes, particularly on cool southerly and south-easterly aspects. Specific mention is made of the forests in the Nyumkombe valley, to the north-east of Mount Nuza and on the Inyanga Downs. There are also a few isolated specimens occuring in a kloof in *Brachystegia* woodland near Melsetter, but this is the only instance which has been recorded of the tree being found elsewhere than in the mountain forest zone. It was not until 1956 that *W. whytei* was first recorded from Portuguese East Africa, on the southern slopes of the Gorongosa Mountains, where up to the present it is only known to occur as a small tree. Outside the Tropics in the mountains of the northern Transvaal *W. whytei* reaches the most southerly limit of its range. Known as the "Transvaal Berg Cypress" it is recorded from kloofs on the heights of the Soutpansberg, Blaauwberg, and Haenertsburg. Although they may very occasionally be found as small trees up to 15 feet in height the members of this outlier occur usually as shrubs rarely exceeding 10 feet in height. Apart from its use in re-afforestation work on the Mlanje range *W. whytei* has been planted elsewhere in the highland areas of Nyasaland. Planting was first begun nearly 60 years ago, on Zomba Mountain about 40 miles from Mlanje. Considerably later the tree was introduced to Dedza Mountain in the Angoni Highlands, and during the past few years trial plots have been established in several promising situations on the Vipya Hills in the north of the territory. In Tanganyika Territory *W. whytei* has been planted experimentally in the Southern Highlands and in the upland country to the north, and it has also been tried in Kenya.

Widdringtonia whytei was discovered on the Mlanje Mountains by Alexander Whyte in 1891 during the course of a two weeks collecting trip for plants and birds He held the position of Head of the Scientific Department in the British Central Africa administration, as it then was. The Commissioner and Consul-General in British Central Africa was Mr. H. H. (later Sir Harry) Johnston, C.B., who was himself a traveller and naturalist of wide interests, and it was at his instigation that Whyte first came out to Africa and was able to make such extensive journeys through what afterwards became the Nyasaland Protectorate. Whyte made extremely valuable botanical and zoological collections not only from the Mlanje Mountains but from places as far distant as the Misuku Hills in the extreme north of the territory.

It was the "typical" form of *W. whytei* which was found by Whyte and was described by Rendle two and a half years later.

UTILIZATION AND EXPLOITATION

Of the various habit forms included under *W. whytei* only the typical tall tree of the Mlanje and Mchese Mountains is of economic importance. From the account given already of its useful properties the valuable contribution made by Mlanje Cedar to the softwood

timber requirements of Nyasaland will be apparent. The other two indigenous conifers, *Juniperus procera* Hochst. ex Endl. and *Podocarpus milanjianus* Rendle, do not constitute a significant source of supply. Until quite recently Mlanje Cedar was the only softwood used for Government purposes. It remained for a long time one of the commonest local building timbers and was employed extensively for interior finishings and furniture making. Roofing shingles of Mlanje Cedar have been used for many years. Apart from the natural durability of the wood it weathers rapidly to a pleasing silver-grey colour when exposed to the atmosphere. One property which does limit the uses to which Mlanje Cedar can be put is the persistence in the wood of the natural oil. Because of this it will not take paint satisfactorily. As, however, the light brown wood has in its natural state a rather satiny sheen this can be an advantage rather than otherwise, as for example when it leads to the realization that what at first glance might appear to be no more than a general utility softwood does in fact possess considerable decorative potentialities in the hands of imaginative craftsmen. Unfortunately probably the only instance in which full advantage has been taken of this relatively unappreciated property of Mlanje Cedar has been in the new headquarters building of the Royal Commonwealth Society in London. In the form of panelling, flooring and furniture the building contains a most comprehensive display of decorative Commonwealth timbers. One of the smaller drawing rooms has been panelled with Mlanje Cedar. The general effect is of restful elegance and by many this is considered to be the most attractive room in the building. The characteristic fragrant scent of the wood can be detected very slightly if the room has been unoccupied for a few days, and this recently led to a visitor from India enquiring whether the panelling was of Deodar. An example of the variety of purposes for which Mlanje Cedar is suitable is the all-timber dwelling house built recently on Chambe plateau by the Forestry Department. The forestry cottage at "Makaluni's" on Tuchila plateau was built of Mlanje Cedar by McClounie nearly 60 years ago. It is still quite sound, and good probably for another hundred years if properly maintained. The large roofing timbers in the fine church built at Palombe Mission by the Montfort Marist fathers are of Mlanje Cedar. In the Lukulezi valley some of the planks now being carried down are from dead trees killed by a disastrous fire probably before Whyte's first visit to the mountains. For many years these trees have been lying where they fell on the mountainside, and except for pockets of rot due to yet earlier fires most of them are still sound. On Tuchila plateau recently a pile of planks left in the forest probably since McClounie's day were found to be sufficiently sound for local carpenters to consider it worthwhile paying the usual royalty for them as well as the extra cost of porterage down from the mountain.

The heartwood is an excellent fuel. Kindling as readily as the resinous "torchwood" obtained from some pines, it gives a bright, very hot fire and a pleasant aroma. The rapidity with which Mlanje Cedar fuel burns limits its use for this purpose to the forestry cottages on

the mountains, close to the source of supply. Charcoal is made on a small scale from the waste wood and branches left behind after exploitation. According to Purves (1910) a thin dark-coloured fragrant oil known as "Mlanje Tar" was formerly obtained by destructive distillation of the wood and valued locally as a wood preservative against termites.

A rather different use for which Mlanje Cedar is considered eminently useful, particularly in Kenya, is as a Christmas tree. It also makes a pretty clipped hedge.

The first survey of the Mlanje Cedar forests was carried out by McClounie when he was the Government Forester in 1898. McClounie reported that the plateau round the source of the Tuchila river was by far the most heavily timbered part of the mountain, with 700 to 800 acres of compact forest. He saw a few straggling trees near the source of the Ruo, but only one of any size. Elsewhere there were, he estimated, about 200 acres of inaccessible forest round the head of the Likabula valley and another 100 acres scattered on the slopes of the Lichenya plateau. As a result of McClounie's report it was on Tuchila plateau that in 1901 exploitation of the forests was begun by the "Botanical and Forestry Department", although it is believed that even prior to this there had been some sporadic cutting by the Public Works Department. The work on the mountain was supervised by the Forester (presumably McClounie himself) and it was at this time that the timber cottage was built. Cutting in those days was confined to the five drier months of the year. Logs weighing 2 or 3 tons were said to be commonplace and the sawpits were made strong enough to carry 10 tons. There were usually six pairs of sawyers working in each pit and even the least skilled of them made 10s. a month or more on piece-work; they also received a free food allowance. Labourers earned 4s. a month and they too were issued with rations.

The sawn timber was headloaded the 3,500 feet down to the plain by local men who received the princely sum of 1s. 3d. for five trips. By way of comparison it is of interest that the standard rate paid to carriers by holiday-makers going up to Tuchila plateau in 1958 was 4s. 6d. for the journey up and 4s. down. Heavy timber was usually slid down the precipitous slopes which naturally resulted in considerable loss through breakage. Transport from the base of the mountain across the plains to the headquarters of the Public Works Department at Zomba was by Angoni labour recruited from the north; they were paid 9d. per man per load for the 40-mile journey. When in 1903 local men ceased to volunteer for work the Angoni carriers had to transport the timber the entire distance from the forests on the plateau to Zomba. Very soon afterwards, however, hut tax came into force and to meet their obligations local people resumed porterage work from the plateau down to the plains. They were then paid 1s. for five trips as against the previous rate of 1s. 3d., but they made

only one trip per day. A report dated October, 1902 states that the cost of output of Mlanje Cedar was 1s. 0¾d. per cubic foot, as against a cost of 9s. per cubic foot for imported timber. In 1904 timber was supplied to the Portuguese Government at Tete. In 1910 a free licence was granted to the railway company for 1,500 cubic feet and eight years later they purchased 62,000 linear feet for £260.

The year 1913 marked a new phase in the exploitation of the cedar forests. The increasing difficulty of porterage down the precipitous slopes of Tuchila had inclined Government to the view that cutting operations there should cease and be transferred to the Likabula valley and the Lichenya plateau. A second and apparently more detailed survey of the exploitable cedar forests was then carried out by Mr. T. F. Firr, the Assistant to the Director of Public Works. In his report this gentleman stated that on the southern side of the Likabula valley there were 350 acres (45 years supply) and on the Lichenya plateau 470 acres (35 years supply); a year's supply was reckoned to be 9,000 cubic feet. Mr. Firr strongly recommended the erection of an overhead cableway (some 3,500 feet in one span) to transport the timber 1,500 feet down, and from thence to the plain the construction of a macadamised road suitable for wheeled traffic for some seven and a half miles. His estimate for the cost of the road and the cableway was £1,500. The outcome of Mr. Firr's recommendation was an instruction from the Director of Agriculture to the Acting Chief Forest Officer that he submit a report setting forth in detail the commercial forest aspect of this subject with special reference to the private market for timber, and estimated revenue . . . "which more than justify the initial outlay in cost of erecting cable, sawmill, etc., at Mlanje". The Acting Chief Forest Officer did not consider the envisaged expenditure to be justified, and amongst other matters he urged the need for a European forest officer to complete surveys and valuation of the forests on Mlanje; to collect statistics to guide future management; to supervise extraction and conversion to reduce present waste; to carry out afforestation work (neglected since 1905, although planting had before then begun on Zomba Mountain); and to carry out effective fire protection. The outcome of this report was a visit in February, 1914, to the Likabula valley and the Lichenya plateau by no less a person than the Governor himself, Sir George Smith. After his visit the Governor minuted that the following facts might be taken as established:—

(i) The existing forests (so called) are not capable of repaying commercial exploitation on the lines previously suggested.

(ii) The demand for Mlanje Cedar outside Government requirements is at present apparently nil.

(iii) The forests are not reproducing themselves naturally.

(iv) They contain much old and dead timber which must be worked up at once or it will be lost.

(v) There has been a profligate cutting of the timber and no little waste in the past.

(vi) The cedars are slow-growing and unless greater activity in re-afforestation is displayed in the early future, the time is not far distant when there will be no Mlanje Cedar in the country, even though its use be restricted to Government requirements.

Five months later the war of 1914-1918 broke out, and until 1921, over three years after its conclusion, there was little active interest in the forests. In 1921 the Chief Forest Officer submitted a memorandum to Government setting out the case for the appointment of a European Forester solely for the work on the Mlanje Mountains. He stressed the fact that unless such a step were taken the increased demand by Government for timber could not be met. The result this time was a Committee of Enquiry consisting of the Director of Agriculture, the Director of Public Works, and the Chief Forest Officer. The report of this Committee resulted in a decision by Government to appoint a European Forester for the work. Mr. J. B. Clements, Forest Officer (and later to become Conservator of Forests), took over the work in 1921, remaining on Lichenya plateau from September until December that year. Mr. Clements began the construction of the forestry cottage on Lichenya, a building subsequently much used by forest officers, holiday makers and latterly (1946) the base of the Vernay Nyasaland Expedition of the New York Botanical Garden when they were collecting on the plateau.

After the departure of Mr. Clements, a forest officer named Searle took over duty. Searle remained on the mountain for two years, by which time it was considered that cutting operations could be reduced and that monthly visits from Zomba would suffice. At one time Mr. Searle found that a visit to all the sawpits alone (i.e., apart from other inspection work) involved two full days of strenuous walking and climbing. In the circumstances, waste in felling and conversion were inevitable. Even with the utmost attempts to reduce it to the minimum, waste in conversion was fairly heavy due to the existence of heart-rot in a high percentage of the trees. The demand for shingles was at that time practically nil, so that there was no way of utilizing waste wood. Early in 1927 a timber depot was opened at Fort Lister in the Gap between the Mlanje and Mchese Mountains, and considerably nearer to Zomba. The main reason for this move from Lichenya was the desire to reduce output costs, and also the fact that the supply of labour on Lichenya was becoming an increasingly difficult matter with the development of the tea estates at the bottom of the mountain. The Director of Public Works agreed to make the depot in the Fort Lister Gap accessible to Zomba by a motor road routed directly across the plain. By 1928 tenders were invited for the transport of timber by motor lorry to Zomba.

In 1927 Mr. J. E. A. Carver, Assistant Conservator of Forests, and at the time acting as Conservator during the absence on leave of Mr. Clements, wrote a memorandum on the subject of future policy. His main suggestions were:—

(1) Full utilization as soon as possible on all plateaux of dead and over-mature Cedar.

(2) To use mechanical labour-saving devices.

(3) To increase control over all of the six plateaux and to prevent damage to Cedar by fires started by poachers.

(4) To erect seasoning sheds at Zomba.

Mr. Carver urged the appointment of an additional European forester with experience of ropeways, and that overhead skidding take the place of carriers. He further recommended that "sawyer gangs" should be formed into companies which would be scattered over all of the plateaux and ravines, and that the possibility of transferring sawmill operations from Zomba to Mlanje should be considered.

In a memorandum discussing Carver's suggestions, Mr. Clements pointed out that all previous investigation and experience had shown that (a) concentrated operations were absolutely essential because of the difficult terrain and other factors, and (b) the scattered blocks of forest were far too small to justify expenditure on costly mechanical devices. In July, 1929, the Director of Public Works agreed to a policy of maintaining at the Mlanje Timber depots a supply of timber equivalent to the estimated requirements of Government for three years. He pointed out that this estimate was at the time exceeded by 4,000 cubic feet. Tenders were therefore invited from the public for the purchase of this amount, but the only response was an offer of 3/6d. per cubic foot by the African Lakes Corporation for 2,000 cubic feet at the Fort Lister depot. The offer was accepted. It is interesting to record that the equivalent of three years supply as estimated by the Director of Public Works was used by his department the following year in six months, owing to special works arising out of the newly established Colonial Development Fund. By 1934 there were definite signs of a falling-off in consumption owing to a new source of supply having become available from essential thinnings in the Mlanje Cedar plantations on Zomba Mountain. Efforts were made to increase sales to the public by means of advertisements, etc. For 15 years prior to this the average annual consumption by the Public Works Department had been slightly under 12,000 cubic feet. It should be mentioned that it was not until 1925 that head porterage across the plains from Likabula depot to Zomba finally ceased. From 1925 to 1928 the timber was taken from the depot by motor lorry to Luchenza railway station and thence to Limbe by rail and on to Zomba by road. Until the opening of the direct road across the plains from Fort Lister to Zomba, the Fort Lister timber went by the same route.

Departmental exploitation of the Cedar on Chambe plateau began in 1938 and continued until in 1950 it was decided to hand over operations to private enterprise under licence. By 1955 all the accessible timber had been removed and the licensees moved out. Over this 18-year period approximately 804,000 cubic feet of timber were extracted from 16 small patches of forest amounting in all to about 350

acres. All this timber was used locally and without it Nyasaland would have been hard pressed to satisfy her softwood requirements. Until 1949 all sawing was done by hand and the timber head-loaded across the plateau and 3,000 feet down a tortuous track to Likabula depot, a total distance of about seven miles. The largest timbers were usually 18′ x 9″ x 3″ although occasionally pieces 20′ in length or more were transported. The best of the carriers, men such as the redoubtable Snowball, often made two trips a day. Such primitive methods sufficed until the immediate post-war years when the greatly increased demand for timber made it necessary to give consideration to the introduction of methods which would ensure a more speedy and greatly increased supply. Thanks to Colonel Lloyd of the Imperial Forestry Institute at Oxford, the answer was soon found. On Colonel Lloyd's recommendation, and after a visit to Switzerland to observe a machine working, Mr. O'Neill, the first licensee, ordered two Wyssen Skyline Cranes for Mlanje. As O'Neill died before his return to Nyasaland, it was his successors, the Nyasaland Plywood Company, who arranged for the installation of the first machine in November, 1951. So far as is known, Nyasaland was the first Commonwealth territory outside Great Britain and Canada to make use of the Wyssen system. Once the Skyline was in operation, timber was extracted by tractor, sawn in a mill on the plateau and transported to the foot of the mountain by lorry and cableway. For a time short log lengths were taken down for plywood manufacture.

From Chambe the licensees moved their equipment to Tuchila plateau where cutting of the Cedar first began over half a century ago. Within a year the Company had found it necessary to close down operations. It would appear that their decision to seek an exclusive licence for the Cedar on Tuchila had been made without due consideration of the fact that most of the accessible stands there had been worked over already. In spite of a constantly increasing demand for sawn timber and a selling price of about 15/- a cubic foot, the Company was unable to continue to work economically. So ended large scale exploitation on the mountains. It is unfortunate that the total volume of timber extracted since fellings first began is not known. The figure would certainly be a very high one, and there is no doubt that the contribution made by these small forests to the timber requirements of Nyasaland for nearly 60 years has been very great. There are still a few small blocks of untouched Cedar forest on the Mlanje range, and there never has been any exploitation on Mchese Mountain. So inaccessible, however, are these that it would be quite uneconomic to attempt to exploit them, and in the majority of cases physically impossible.

One last matter which should be mentioned concerning the Cedar forests on the Mlanje Mountains is the privately owned forest in the Lukulezi valley on the northern front of the range above the Montfort Marist Mission's estate. Originally forming a part of the large Livingstone-Bruce estates and held under a Certificate of Claim issued in

1894. this forest would undoubtedly not have been allowed to fall into private hands had application for the land not been made at such a very early stage in the history of the Protectorate. It is unlikely that Sir Harry Johnston, when he granted the Certificate of Claim, was aware of what a valuable Government asset was being virtually given away. The original owners began timber cutting long ago, perhaps 50 or 60 years back. A desultory effort was at one time made to replant the cut-over stands, but nothing came of it. Ever since there has been a steady out-turn of timber from the valley. The Lukulezi forest is a valuable source of revenue to the mission. Not only can their own softwood requirements be met from it, but there is a considerable surplus available for sale, and they are now the only producers of large dimensioned Cedar. During the last year or two the rate of extraction has increased. Even during the height of the rainy season work continues with several gangs of sawyers operating in different parts of the valley, and the intention is obviously to work the forest right out in the shortest possible time. All the sawing is by hand and the timber is headloaded out in the old way. Tribute is certainly due to the often rather diminutive little men who come forward as porters. After a long walk, which entails a climb of up to 4,000 feet, they bring out the timber over terrain on which the average European finds it rather an effort to move at all, let alone when burdened with a heavy 12-foot plank.

Apart from a certain amount of re-afforestation on the Mlanje Mountains, most of the planted Cedar in Nyasaland is on Zomba Mountain. The oldest plantations were established between 50 and 60 years ago and already in the form of thinnings have supplied a very considerable volume of timber.

In conclusion, the writer wishes to acknowledge the help and advice, especially as regards taxonomy, which he has received from Mr. F. White, Forest Botanist at the Imperial Forestry Institute.

REFERENCES

Britten, J., et al (1894). The Plants of Milanji, Nyasaland, collected by Mr. Alexander Whyte, F.L.S. *Trans. Linn. Soc., Bot., Ser. 2*, **4**.

Burtt Davy, J. (1926). *The Flowering Plants and Ferns of the Transvaal and Swaziland*. Longmans Green, London.

Chalk, L., et al (1932). *Some E. African Coniferae and Leguminosae*. Oxford.

Clements, J. B. *A Working plan for the Widdringtonia Forests in the Mlanje Mt. and Mchese For. Res. for the period 1940-1950* (MS).

Dallimore, W., & Jackson, J. B. (1948). *A Handbook of Coniferae*, ed. 3. Arnold, London.

Engler, A., & Prantl, K. (1926). *Die Naturlichen Pflanzenfamilien*, ed. 2. **13.** Engelmann, Leipzig.

Erdtman & Thomas (1958). Heartwood Constituents of the genus Widdringtonia. *Acta Chem. Scand.* **12,** 2.

Gilliland, H. B. (1938). Vegetation of Rhodesian Manicaland. *Journ. S. Afr. Bot.* **4**.

Henkel, J. S. (1931). Types of Vegetation in S. Rhodesia. *Proc. Rhod. Sci. Ass.* **30**.

Hill, A. W. (1933). *Flora Capensis* **5**, 2, Suppl. Reeve, London.

Hubbard, C. S. (1937). Observations on the distribution and rate of growth of Clanwilliam Cedar. *S. Afr. Journ. Sci.* **33**.

Nyasaland Forest Dept. Annual Reports 1940-1958; Statements to B.E.F.C. 1947, 1952 & 1957.

Prain, D. (1917). *Flora of Tropical Africa* **6**, 2, Reeve, London.

Purvis, J. M. (1910). *Some Notes on Tree Planting in Plantings in the Shire Highlands.* Govt. Printer, Zomba.

Sim, T. R. (1906). *The Forests and Forest Flora of the Colony of the Cape of Good Hope.* Taylor and Henderson, Aberdeen.

—(1921) *Native Timbers of S. Africa.* Govt. Printer, Pretoria.

Smith, C. A. (1955). Early 19th Century Records of Clanwilliam Cedar. *Journ. S. Afr. For. Ass.* **25**.

Ward, J. H. (1958). Notes on the Cedar of Willowmore. *Journ. S. Afr. For. Ass.* **31**.

Willan, R. G. M. (1953). Timber Extraction in Nyasaland by Wyssen Skyline Crane. *Emp. For. Rev.* **32**.

A NEW SPECIES AND A NEW VARIETY OF ALOE FROM SOUTHERN RHODESIA

by

G. W. Reynolds

Aloe howmanii Reynolds. Species nova (Sect. *Leptoaloe*), affinis *A. inyangensis* Christian, ita differt: tota planta pendens, folia falcato-decurva, marginibus hyalinis integris vel brevissime dentatis, flores breviores.

Tota planta pendens, caulibus 20-30 cm. longis, 12 mm. diam., e basi ramosis. *Folia* 6-12, disticha, basi imbricato-vaginata, linearia, saepe falcato-decurva, 15-20 cm. longa, 12-15 mm. lata; *supra* viridula, immaculata, basi plana, superne plano vel bi-convexa; *subtus* convexa; marginibus parallelis, hyalinis, integris vel minute dentatis; apice obtuso breviter cuspidato.

Inflorescentia simplex, usque 20-25 cm. longa, pendens, racemo adscendenti. *Racemus* subcapitatus, 4-5 cm. longus, sublaxe 12-18-floribus. *Bracteae* ovato-acutae, 3-4 mm. longae, 2 mm. latae, 3-nervatae. *Pedicelli* 10-15 mm. longi. *Perianthium* flammeo-coccineum, 24 mm. longum, cylindrico-trigonum, basi obconicum et brevissime stipitatum, circa ovarium 5 mm. diametro; *segmenta exteriora* libera, *interiora* latiora, carinata. *Antherae* non vel brevissime exsertae. *Stigma* demum 1-2 mm. exserta. *Ovarium* pallide aurantiacum, 3 mm. longum, 1.5 mm. diametro. (Tab. XV.)

SOUTHERN RHODESIA. Melsetter Distr., Chimanimani Mts., 6000 ft., fl. 1.v.1957, *J. S. Ball* 646 (PRE, holotype; SRGH without flowers); ix.1945, *R. C. Munch* 4 (SRGH); fl. 6.vi.1949, *H. Wild* 2881 (K; PRE; SRGH); fl. v.1956, *K. Coates Palgrave* in GHS 70624 (SRGH).

A. howmanii is the name by which this hitherto undescribed species has been known for several years, and it is named after Mr. Roger Howman, who was Native Commissioner at Ndanga and Zaka until 1939, and later at Melsetter.

During the Easter Holidays of 1940, Mr. Howman visited the Chimanimani Mountains (east of Melsetter) and collected plants of "a small aloe hanging on cliff faces, mostly in inaccessible places so that they could only be reached by lying down and reaching over the edge." Plants were sent to the late Mr. H. B. Christian at Ewanrigg, but he was unable to describe the species.

Plants have subsequently been collected by Dr. H. Wild, Mr. J. A. Whellan, Mr. R. C. Munch, Mr. John Ball, myself and others, mostly at the top of the very steep gully of the main ascent of the Chimanimanis at an altitude of 5,500-6,000 ft. Mr. Ball has also found plants on steep upper slopes of Point 71, at 7,800 ft.

A. howmanii grows mostly in inaccessible places on sheer rock faces, out of reach of grass fires, and mostly on south slopes getting little or no sun in the winter months. Stems and leaf clusters are pendant with only the raceme upturned. Leaves are fleshy and somewhat biconvex in cross-section, while their margins have a distinctly translucent hyaline border about 1.5 mm. broad, which shows up clearly when viewed against the light. These characters, and shorter flowers, distinguish *A. howmanii* from its nearest ally, *A. inyangensis* Christian.

Plants flower in late April and May, and rarely survive or flower in cultivation.

DESCRIPTION. *Plant* succulent, with few or several stems, pendent on cliff faces, or overhanging ledges.

Stems simple or branched from base, 20-30 cm. long, 12 mm. diam.

Leaves 6-12, distichous, basally sheathing-imbricate, linear, 15-20 cm. long, 12-15 mm. broad, mostly falcately decurved; *upper surface* green, without spots or markings, flat at base, slightly convex upwards; *lower surface* green, usually without spots but sometimes with a few small white spots near base; *margins* parallel, with a $1\frac{1}{2}$ mm. broad translucent hyaline border, entire or with minute teeth about 2-4 mm. distant; leaf apex obtuse, shortly cuspidate.

Inflorescence simple, 20-25 cm. long, hanging downwards, with the raceme upturned.

Peduncle basally plano-convex and 6-7 mm. broad, slightly compressed laterally and 4 mm. diam. below the raceme, clothed with a few scattered broadly ovate-acute sterile-bracts.

Raceme subcapitate, cylindric, slightly conic, 4-5 cm. long, sublaxly about 12-18-flowered, the buds denser and suberectly spreading, open flowers slightly laxer, nutant to subpendulous.

Bracts ovate-acute, 3-4 mm. long, 2 mm. broad, subscarious, 3-nerved.

Pedicels 10-15 mm. long, the colour of the perianth.

Perianth flame-scarlet, 24 mm. long, cylindric slightly ventricose, basally obconic and shortly stipitate, 5 mm. diam. across the ovary, slightly narrowed at the green-tipped mouth; *outer segments* free to base; *inner segments* free, broader than the outer, with a prominent scarlet keel turning green at the more obtuse, more spreading apices.

Filaments pale lemon, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 0-1 mm.

Style pale yellow, with *stigma* at length exserted 1-2 mm.

Ovary pale-orange, 3 mm. long, 1.5 mm. diam.

A. torrei Verdoorn et Christian var. **wildii** Reynolds. Varietas nova, a forma typico foliis 4-6 distichis, bracteis et pedicellis brevioribus differt.

Planta parva, acaulescens. *Folia* c.6, disticha, saepe 15-20 cm. (interdum usque 30 cm.) longa, 5-10 mm. lata, suberecta, viridula; marginibus dentibus cartilagineis albidis ½ mm. longis, 1-2 mm. distantibus munita.

Inflorescentia simplex, saepe 25-30 cm. (interdum 40-50 cm.) alta. *Racemus* 6-7 cm. longus, 5 cm. diam., c.12-16-floribus. *Bracteae* ovato-acute, 5 mm. longae, 2-3 mm. latae, subscariosae. 3-nervatae. *Pedicelli* 10-15 mm. longi. *Perianthium* aurantiaco-coccineum, cylindrico-ventricosum, 30 mm. longum; *segmenta exteriora* libera, obscure nervata; *interiora* latiora, carinata. *Antherae* 0-1 mm. exsertae. *Stigma* demum 1-2 mm. exserta. *Ovarium* 3 mm. longum, 1½ mm. diametro. (Tab. XVI.)

SOUTHERN RHODESIA. Melsetter Distr., Chimanimani Mts., Martin Forest Reserve, The Corner: 5,000 ft., fl. 9.x.1950, *H. Wild* 3541 (K; PRE; SRGH, holotype); without date, *L. C. Leach* 9360 (PRE); cult. Johannesburg, fl. 20.ix.1954, *G. W. Reynolds* 6247 (PRE); 4,500-5,000 ft., fl. x.1950, *D. C. Plowes* 1213 (SRGH); 4,400 ft., 8.x.1950, *N. C. Chase* 2946 (SRGH); above base of Long Gully on lower slope of end range, fl. ix.1955, *R. Watmough* 140 (SRGH).

Our new variety is named after Dr. H. Wild, Senior Botanist, Federal Department of Agriculture, Salisbury, who first brought it to my notice. It has been known for several years at The Corner, Martin Forest Reserve, near the foot of the north-western end of the Chimanimani Mountains, about 10 miles north-east of Melsetter.

Mr. R. C. Munch collected plants in 1944 and sent them to the late Mr. H. B. Christian at Ewanrigg, but nothing further eventuated.

The typical form of *A. torrei* was found on the Gurue Mountains, Quilemane District, Moçambique, about 100 miles ENE of Mt. Mlanje, Nyasaland. The type is described as having a stem 10 cm. long, leaves 10-12, rosulate, 45 cm. long and deflexed at the middle, inflorescence 50 cm. tall, bracts 13 mm. long, 7 mm. broad and closely enfolding the 20 mm. pedicels.

Var. *wildii* is acaulescent and is distinguished by having only 6-8 leaves that are distichous, rather rigidly suberect and averaging 15-25 cm. in length; the inflorescence averages 25-30 cm. high; the bracts are much smaller and do not enfold the pedicels which average 10-15 mm. long.

The type flowered in Pretoria in March, 1944, while var. *wildii* flowers at The Corner—also in cultivation in Johannesburg—in September.

The type of var. *wildii* (Wild 3541) is a much larger specimen than is usually found wild.

DESCRIPTION. *Plant* acaulescent, solitary or with a few shoots from ground level forming small groups.

Leaves about 6, distichous, rather rigidly suberect, averaging 15-20 cm. (sometimes 30 cm.) long, basally imbricate-sheathing, thence linear upwards and 5-10 mm. broad; *upper surface* slightly canaliculate, dull green with brownish tinge, with a few scattered small white spots low down; *lower surface* convex, similar in colour to upper surface, copiously white-spotted low down, fewer upwards, the spots exceedingly shortly spinulescent; *margins* with very small soft white cartilaginous teeth about ½ mm. long, 1-2 mm. apart, larger and more crowded low down, smaller to obsolescent upwards.

Inflorescence simple, averaging 25-30 cm. tall (sometimes up to 50 cm. tall in very robust specimens).

Peduncle 5 mm. diam., clothed with a few sterile-bracts, the lowest shortly ovate-acute, 5 mm. long and broad, thin, 3-5-nerved.

Raceme 6-7 cm. long, 5 cm. diam., about 12-16-flowered, the buds suberect and denser, open flower subpendulous and laxer.

Bracts dull-pink, ovate-acute, 5 mm. long, 2-3 mm. broad, thin, subscarious, 3-nerved.

Pedicels nutant at apex, 10-15 mm. long, the colour of the perianth.

Perianth bright orange-scarlet, green-tipped, cylindric-ventricose, 30 mm. long, basally tapering into the pedicel and shortly stipitate; *outer segments* free to base; *inner segments* carinate, broader than the outer and with more obtuse more spreading apices.

Filaments filiform-flattened, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 0-1 mm. *Stigma* at length exserted 1-2 mm. *Ovary* dull yellow, 3 mm. long, 1½ mm. diam.

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A NEW ALOE FROM ANGOLA

by

G. W. Reynolds

Aloe catengiana Reynolds, species nova, affinis *A. palmiformis* Bak., caulibus gracilioribus, foliis angustioribus, dentibus minoribus, pedicellis et floribus brevioribus differt.

Planta frutescens, e basi ramosa, caulibus 1.5-2 m. longis. *Folia* pallide viridula, patula vel deflexa, 30 cm. longa, 3.5 cm. lata; *supra* plana vel leviter canaliculata, maculata; *subtus* convexa, maculata; marginibus dentibus 3 mm. longis, 8-10 mm. distantibus munita.

Inflorescentia gracilis, 40 cm. alta, c. 6-ramosa. *Racemi* sublaxi, cylindrico-acuminati, terminales 16 cm. longi, 4 cm. diam. *Pedicelli* 10 mm. longi. *Bracteae* ovato-acutae, scariosae, 5 mm. longae, 3 mm. latae, plurinervatae. *Perianthium* pallide coccineum, cylindricum, 28 mm. longum, circa ovarium 7 mm. diam.; *segmenta exteriora* per 10 mm. libera, obscure 3-nervatae; *interiora* latiora, obtusiora. *Antherae* 0-1 mm. exsertae. *Stigma* demum 1-2 mm. exserta. *Ovarium* viridulum, 6 mm. longum, 3 mm. diametro. (Tab. XVII & XVIII.)

ANGOLA. Benguela Prov., at Catengue, 60 miles SE of Benguela, c. 13°S, 13°45'E, alt. c. 1,700 ft., cult. Bryanston, Johannesburg, fl. 17 July, 1960, *Reynolds* 9307, holotype (PRE), isotype (K).

Our new species was found by Dr. N. R. Smuts and myself just east of Catengue Railway Station, which is about 60 miles SE of Benguela, in hot arid bush country in association with *Adansonia digitata, Adenium boehmianum, Aloe littoralis, Euphorbia spp.*, etc., at 1,700 ft. alt.

A. catengiana forms dense thickets of more or less tangled stems in patches 3 metres and more across. Stems are slender, and leaves are of a peculiar pale yellowish grey-green colour and are usually copiously spotted on both surfaces. The inflorescence is slender and divaricately branched. Racemes vary from the terminal erect with flowers evenly distributed around the axis, to oblique when flowers are somewhat secund.

The late Dr. Gossweiler collected specimens at Catengue in July, 1940, and queried the species as belonging to *A. palmiformis* Bak. Plants of *A. palmiformis* that I have seen near the type locality, on a spur of the Serra da Chela, 8 miles SW of Sá da Bandeira, in Huila Province at 6,000 ft. and more, are quite distinct and differ in having more robust stems, larger green leaves with much larger teeth, a more stout, taller, less branched inflorescence, and longer pedicels and flowers.

Native Name: *Okandolle* in the local Umbundu tongue of Catengue —*fide* Gossweiler in *Nomes Indiginas de Plantas de Angola* 491 (1953).

DESCRIPTION. *Plant* shrubby, forming thickets 1-2 m. and more across.

Stems slender, simple or branched low down, averaging 1.5-2 m. long (sometimes 3 m. and more when supported in bushes), ascending, divergent or sprawling, the apical 30 cm. sublaxly foliate, the sheathing leaf bases lineate and 15-20 mm. apart.

Leaves 16-20, narrowly lanceolate-attenuate, averaging 30 cm. long, 3.5 cm. broad, spreading to deflexed near base; *upper surface* pale yellowish grey-green (near Light Cress Green RCS XXXI), flat low down, slightly canaliculate upwards, with numerous very pale green lenticular spots in lower half, fewer and more scattered upwards; *lower surface* convex, similar in colour, with numerous very pale green lenticular spots throughout, more numerous and crowded low down, more scattered upwards; *margins* with firm pale deltoid reddish brown-tipped teeth about 3 mm. long, 8-10 mm. apart.

Inflorescence slender, a branched panicle 40 cm. tall, erectly or sub-erectly produced.

Peduncle green, plano-convex and 8 mm. broad at base, divaricately about 6-branched from the middle or lower, the lowest branch subtended at base by a narrowly deltoid scarious many-nerved bract about 25 mm. long, 7 mm. broad.

Racemes cylindric-acuminate, rather laxly flowered, the terminal the longest, 16 cm. long, 4 cm. diam., the lateral shorter, oblique, with the flowers subsecund.

Pedicels 10 mm. long.

Bracts ovate-acute, thin, scarious, many-nerved, 5 mm. long, 3 mm. broad.

Perianth dull scarlet, cylindric, slightly decurved, 28 mm. long, 7 mm. diam. across the ovary, very slightly, narrowed above the ovary, thence slightly enlarging to the throat; *outer segments* free for 10 mm., paler at the edges, obscurely 3-nerved, the apices subacute and slightly spreading; *inner segments* broader than the outer, the apices more obtuse and slightly more spreading.

Filaments pale lemon, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 1-2 mm. *Stigma* at length exserted 2 mm.

Ovary green, 6 mm. long, 3 mm. diam.

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I am deeply indebted to:—

The South African Council for Scientific and Industrial Research for travelling grants that have enabled me to investigate the Aloes of Angola, and elsewhere in Africa.

Dr. R. A. Dyer, Chief, Division of Botany, Pretoria, for the facilities of the National Herbarium, and for photographs.

A NEW ALOE FROM TANGANYIKA TERRITORY

by

G. W. Reynolds

Aloe compacta Reynolds, species nova, *A. trothai* Berger affinis, foliis latioribus, dentibus majoribus, pedicellis et floribus brevioribus differt.

Planta acaulescens vel inderdum caulibus decumbentibus usque 50 cm. longis. *Folia* c. 20, rosulata, lanceolato-attenuata, 30-45 cm. longa, 7-8 cm. lata, arcuato-adscendentes, leviter recurvula; *supra* pallide viridula, leviter canaliculata; *subtus* convexa, saepe copiose maculata; marginibus dentibus 2-3 mm. longis, 10 mm. distantibus munita.

Inflorescentia compacte 4-5-ramosa, 120 cm. alta. *Racemi* anguste cylindrico-acuminati, 30 cm. longi, gemmis bracteis imbricatis obtectis. *Bracteae* late ovato-acutae, 13 mm. longae, 8 mm. latae, plurinervatae. *Pedicelli* 15 mm. longi.

Perianthium pallide coccineum, cylindricum, 35 mm. longum, leviter curvulum, circa ovarium 6 mm. diametro, deinde leviter ampliatum; *segmenta exteriora* per 10 mm. libera; *interiora* latiora, obtusiora. *Antherae* 2-3 mm. exsertae. *Stigma* demum 3-4 mm. exserta. *Ovarium* 6 mm. longum, 2.5 mm. diametro. (Tab. XIX & XX.)

TANGANYIKA TERRITORY. Western Province, 24 miles south of Uvinza, c. 5°23′S, 30°25′E, alt. 5,000 ft., cult. Bryanston, Johannesburg, fl. 10 July, 1960. *Reynolds* 8936, holotype (PRE), isotype (K).

A. compacta was found by Dr. N. R. Smuts and myself in July, 1958, in the well-wooded highlands 24 miles south of Uvinza on the road to Mpanda, at an elevation of 5,000 ft., in an area infested with Tsetse flies.

Uvinza is on the Malagarazi River east of Kigoma (port on L. Tanganyika), 47 miles south of Kasula and 124 miles north-west of Mpanda in the Western Province of Tanganyika Territory.

I visited Uvinza searching for *A. trothai* Berger, which was described as having *leaves* 20-60 cm. long, 3 cm. broad, with marginal teeth scarcely 2 mm. long; *inflorescence* simple, 1 m. tall; *bracts* clasping the pedicel; *pedicels* 20 mm. long; *perianth* (dry) 40-45 mm. long.

Von Trotha's route from Bagamoyo on the coast to Tabora and L. Tanganyika passed through Uvinza, more or less along the present railway line at an altitude of about 3,200 ft. I could find no plants near Uvinza fitting the description or type material of *A. trothai*.

A. compacta, found 24 miles to the south of Uvinza and nearly 2,000 ft. higher, appears to be a near ally, but differs in having much broader leaves with larger marginal teeth, bracts not clasping the pedicels, shorter pedicels and shorter flowers.

A striking character of *A. compacta* (which suggested the specific epithet) is the exceptionally compactly branched inflorescence. The two lowest branches produce racemes as long as the terminal and average 30 cm. long, but the two higher branches are much shorter, with all racemes lying very close to the main axis.

Another near ally, found 170 miles away to the south-east, is *A. venusta* Reynolds (see *Journ. S.A. Bot.* 25: 211 (1959)), but this species differs in having compact rosettes of leaves that are copiously spotted on both sides, a divaricately much more branched inflorescence, and slightly shorter perianths that are minutely pubescent.

DESCRIPTION. *Plant* succulent, solitary or in small groups, on rocks.

Stem none or short, sometimes 50 cm. long, decumbent.

Leaves about 20, densely rosulate, lanceolate-attenuate, 30-45 cm. long, 7-8 cm. broad at base, arcuate-ascending and slightly recurved; *upper surface* flat low down, slightly canaliculate upwards, dull green with reddish tinge, usually with a few small scattered white spots low down; *lower surface* of similar colour, usually with numerous dull white lenticular spots throughout; *margins* with a pinkish edge armed with teeth of the same colour and averaging 2-3 mm. long, 10 mm. apart. Sap dries yellow.

Inflorescence simple and 1 m. tall in young plants only, mature specimens 4-5-branched and 120 cm. tall.

Peduncle reddish-brown, plano-convex and 25 mm. broad at base, very narrowly and compactly 4-5-branched from the middle or lower, the lowest branch subtended at base by a narrowly deltoid brittle white many-nerved bract 10 cm. long, 2.5 cm. broad.

Racemes narrowly cylindric-acuminate, the terminal and those of the two lowest branches 30 cm. long, 6 cm. broad, the buds for some time hidden by large densely imbricate bracts.

Bracts broadly ovate-acute, 13 mm. long, 8 mm. broad at the middle, scarious, many-nerved.

Pedicels 15 mm. long.

Perianth pale scarlet-red, 35 mm. long, cylindric slightly decurved, basally obtuse and shortly stipitate 6 mm. diam. across the ovary, slightly enlarging to the throat; *outer segments* free for 10 mm., paler at the margins, obscurely nerved, the apices slightly spreading; *inner segments* broader than the outer, with three crowded nerves forming a scarlet keel, the apices more obtuse and slightly more spreading than the outer.

Filaments pale orange, the three inner narrower and lengthening before the three outer with their *anthers* in turn exserted 2-3 mm.

Stigma at length exserted 3-4 mm. *Ovary* pale green, 6 mm. long, 2.5 mm. diam.

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Dr. R. A. Dyer, Chief, Division of Botany, Pretoria, for the facilities of the National Herbarium, for photographs and for much other assistance.

Tab. XV. **Aloe howmanii** Reynolds
Flowering stem x 1/3 (collected by Mr. John Ball on the Chimanimani Mountains). Flowers 1/1.

Tab. XVI. **Aloe torrei** Verdoorn & Christian var. **wildii** Reynolds.

Plants collected by Mr. and Mrs. A. O. Crook at the Corner, 10 miles NE. of Melsetter, cult. Johannesburg, Sept., 1954. Height 30 cm. Flowers 1/1 from bud to post-pollination stage.

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Flowering stem x 1/3 (collected by Mr. John Ball on the Chimanimani Mountains). Flowers 1/1.

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Tab. XVII. **Aloe catengiana** Reynolds

Plants collected at Catengue, 60 miles SE of Benguela, Angola, flowering in July, 1960, in Bryanston, Johannesburg. Height 5 feet.

Tab. XVIII. **Aloe catengiana** Reynolds
Flowers 1/1, from bud to post-pollination stage.

Tab. XVII. **Aloe catengiana** Reynolds

Plants collected at Catengue, 60 miles SE of Benguela, Angola, flowering in July, 1960, in Bryanston, Johannesburg. Height 5 feet.

Tab. XVIII. **Aloe catengiana** Reynolds
Flowers 1/1, from bud to post-pollination stage.

Tab. XIX. **Aloe compacta** Reynolds

Plant from 24 miles south of Uvinza, Western Province, Tanganyika Territory, cult. Johannesburg, fl. 10 July, 1960.

Height 4 feet.

Tab. XX. **Aloe compacta** Reynolds

Flowers from bud to post-pollination stage, with bract, natural size.